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Appendices

Chapter 1
Appendices

Appendix 1-A. Legal Guidelines

The following statutes and executive orders (as amended) constitute the major legal guidance for planning and management of lands administered by BLM in western Oregon. This list is not necessarily all inclusive but does represent the primary legal guidance to be considered in preparation of the Resource Management Plan.

Federal Land Policy and Management Act of 1976 (FLPMA)	43 USC 1701
The O&C Sustained Yield Act of 1937	43 USC 1181a
National Environmental Policy Act of 1969 (NEPA)	42 USC 4321
Environmental Quality Improvement Act of 1970	42 USC 4371
Executive Order 11514, Protection and Enhancement of Environmental Quality (1970)	
Taylor Grazing Act	43 USC 315
Recreation and Public Purposes Act	43 USC 869
Unlawful Inclosures or Occupancy Act	43 USC 1061
Mining and Minerals Policy Act of 1970	30 USC 21a
Mining Act of 1872	30 USC 26
Mineral Leasing Act of 1920 (Mineral Lands Leasing Act)	30 USC 181
Materials Act of 1947	30 USC 601
Geothermal Steam Act of 1970	30 USC 1001
Geothermal Energy Act of 1980	30 USC 1501
Antiquities Act of 1906	16 USC 431
Historic Sites, Buildings, and Antiquities Act	16 USC 461
National Historic Preservation Act	16 USC 470
Archaeological Resources Protection Act of 1979	16 USC 470aa
Reservoir Salvage Act of 1960	16 USC 580m-n
Fish and Wildlife Coordination Act	16 USC 661
Bald Eagle Protection Act	16 USC 668
Sikes Act	16 USC 670a
Migratory Bird Treaty Act	16 USC 703
Migratory Bird Conservation Act	16 USC 715
Wilderness Act	16 USC 1131
National Trail Systems Act	16 USC 1241
Wild and Scenic Rivers Act	16 USC 1271
Executive Order 11644, Use of Off-Road Vehicles on the Public Lands (1972)	
Executive Order 11989, Off-Road Vehicles on Public Lands (1977)	
Wild Free-Roaming Horses and Burros Act	16 USC 1331
Coastal Zone Management Act of 1972	16 USC 1451
Endangered Species Act of 1973	16 USC 1531
Soil and Water Resources Conservation Act of 1977	16 USC 2001
Executive Order 11988, Floodplain Management (1977)	
Executive Order 11990, Protection of Wetlands (1977)	
Coastal Barriers Resources Act	16 USC 3501
Land and Water Conservation Fund Act of 1965	16 USC 4601-4
Federal Water Pollution Control Act/Clean Water Act	33 USC 1251
Safe Drinking Water Act	42 USC 300 (f)
American Indian Religious Freedom Act	42 USC 1996
Resource Conservation and Recovery Act of 1976	42 USC 6901
Clean Air Act	42 USC 7401
Comprehensive Environmental Response, Compensation and Liability Act of 1980	42 USC 9601
Emergency Planning and Community Right-to-Know Act of 1986	42 USC 11001

Appendix 1-B. Portions of *Record of Decision, Northwest Area Noxious Weed Control Program*

The following is verbatim from the *Supplemental Record of Decision, Northwest Area Noxious Weed Control Program* of May 5, 1987. (The remainder of the Supplemental Record of Decision, including the Rationale, is incorporated by reference):

The Decision and Its Specific Provisions

To control or eradicate noxious weeds, BLM will use six commercial products containing herbicides: Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4. These formulations contain different herbicides designed to kill or retard the growth of noxious weeds: dicamba in Banvel; glyphosate in Rodeo; picloram in Tordon 22K and Tordon 2K; and 2,4-D in Esteron 99 and DMA-4.

BLM will use the herbicide formulations as part of its ongoing program for controlling or eradicating noxious weeds. BLM has been using three methods. If noxious weeds are susceptible to insects, pathogens, or grazing by goats or sheep, BLM may introduce those biological agents to retard weed growth. BLM may also use laborers to manually remove noxious weeds and apply mechanical treatment—burning, mowing, and tilling. With this record of decision, BLM may use the herbicide formulations as a fourth technique.[1]

The provisions governing the use of Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4 to control or eradicate noxious weeds parallels the features stated under Alternative I in the FEIS, Chapter I; the SEIS, Appendix I; and BLM policy statements and manuals referred to in those documents. The word "parallels" is used because the decision in several instances differs from the original proposal by requiring the more judicious use of the substances to avoid or minimize environmental effects of their use.

BLM will apply Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4 only in accordance with the standards that the Environmental Protection Agency (EPA) imposes upon their public use. These standards are stated on the product labels.

BLM will use the commercial products only if the noxious weeds targeted for treatment are susceptible or highly susceptible to their herbicides. What this means is that the commercial products' herbicides, with one treatment, can retard at least 85 percent of the growth of the targeted noxious weeds. BLM will not use herbicide formulations if another method is more effective.

The herbicide formulations may be applied by helicopter; by ground vehicles equipped with boom or handgun sprayers; or by workers with backpack sprayers, broadcast cyclone sprayers, or tools for hand wiping the substances onto the plants.

Ordinarily, two considerations govern the choice of method. The choice first depends upon the treatment objective, topography of the treatment area, expected costs, and equipment limitations. The second consideration is the selectivity of the herbicides. Since Rodeo, which contains glyphosate, is not selective in the plants it kills or retards, it may be applied only from the ground to the noxious weeds targeted for treatment. And because the other herbicide formulations are toxic to conifer seedlings, the same restriction applies to how these herbicides are applied if conifers are being grown as commercial timber on the site to be treated. The restriction does not apply once the conifer seedlings become dormant, usually in the late summer. Unless conifers are present, the herbicides in Banvel (dicamba), Tordon 22K and Tordon 2K (picloram), and Esteron 99 and DMA-4 (2,4-D) may be applied by any method.

In applying the herbicide formulations, BLM will also abide by the following measures to reduce environmental impacts. None of the products may be applied within 500 feet of any residence or other place of human occupation unless the occupant or resident gives his consent in writing. Commercial products will not be applied within l00 feet of any croplands or by helicopter within l00 feet of any surface waters or identified ground water recharge area. Nor will the commercial products be applied by ground vehicles equipped with boom sprayers within 25 feet of any waters. Spot treatments with vehicle-mounted handguns or with backpacks will not be applied within 10

[1]BLM will not use products containing dicamba, glyphosate, picloram, and 2,4-D on public lands administered by its Oregon State Office until the court dissolves its injunction in *Northwest Coalition for Alternatives to Pesticides v. Block et al.*, No 83-6272-E (D. Ore. 1984).

feet of water. Herbicides will be wiped on individual plants up to the current water line and will be applied by helicopters only when wind velocity does not exceed 5 miles per hour. Wind speeds may not exceed 8 miles per hour under any other herbicide application method.

Certain restrictions also govern the equipment used to apply the formulations. Spray nozzles on all helicopters and ground vehicles must be set to produce spray droplets with a median diameter of 200 microns or larger. Helicopter and ground vehicle equipment must also operate with a boom pressure of 20-35 pounds per square inch, unless the herbicide's label specifies a different pressure. Aerial applications must be within 100 feet of the ground. Backpack applications of liquid formulations will be allowed only with low nozzle pressure and within 2.5 feet of the ground. Granular formulations will be applied by broadcast spreaders only within 3.5 feet of the ground.

One final set of restrictions governs the maximum amount of the herbicides in each of the commercial products that may be applied. The FEIS, as modified by the SEIS, includes a table showing the maximum rates of application. BLM's proposal was to apply dicamba at 6 pounds per acre, glyphosate at 3 pounds per acre, picloram at l pound per acre, and 2,4-D at 3 pounds per acre. If, however, small animals susceptible to dicamba or 2,4-D are on the site to be treated and represent sensitive wildlife species in the area, BLM will not use these substances if glyphosate or picloram can be used instead. Or, if that is not possible, BLM will substantially reduce the amount of dicamba or 2,4-D to be applied per application. In addition, BLM ordinarily will apply the commercial products only once a year to any site and, except under circumstances where control or eradication goals are not achieved, no more than three times during the program's span.

The provisions governing BLM's use of herbicides in this program require measures to mitigate possible environmental effects. More mitigation measures are included in the FEIS, the SEIS, and the policy statements and manuals they cite. All are incorporated by reference into this supplemental record of decision. The purpose of the mitigation measures is to ensure the judicious use of the herbicides.

BLM projects that it will annually use the herbicide formulations to control or eradicate noxious weeds on about 21,300 acres of the public lands in the Northwest: 7,800 acres in Idaho, 5,600 acres in Montana, 6,600 acres in Oregon and Washington, and 1,300 acres in Wyoming.

BLM will treat public lands infested or potentially threatened by noxious weeds according to a set of priorities, which are detailed in the SEIS, page 119. The priorities represent BLM's commitment to pursue all existing methods for controlling or eradicating noxious weeds, including the use of herbicide formulations, with no undue reliance on any one means. The priorities detailed in the SEIS are part of this decision.

The following is verbatim from the original Record of Decision of April 7, 1986. (The remainder of the Record of Decision is incorporated by reference):

Management Emphasis

To give definition to the integrated management called for by this decision, the Bureau also shall treat public lands infested or potentially threatened by noxious weeds according to a set of priorities. The priorities are three-fold: (1) prevention, i.e., stopping noxious weed species from being introduced onto public lands; (2) eradication, i.e., halting the spread of noxious weeds by eradicating invading noxious weeds; and (3) control, i.e., limiting well established infestations competing with desired vegetation. The remaining program direction on setting priorities for treatment largely represents a paraphrase of the consensus reached in Idaho between the BLM State Office there and affected interests.

Priority I and II - prevention and eradication of new invaders. Prevention is often the most practical means of controlling noxious weeds. This priority shall be accomplished in part by educating public land users, and where possible, conditioning their use in a way that improves the chances that new weed seeds are not carried onto public lands. The agency's first treatment priority shall be stopping a given species from contaminating an area. More concretely, priority in treatment shall be given to those areas that noxious weeds have newly invaded. Eradicating new invaders shall have highest priority in treatment and funding.

Priority III - control. Weed species in this treatment priority are those that have become so established that for all practical purposes eradication is not feasible. Under this priority, noxious weeds will be treated for the purpose of reducing the population to a level that restores an area's ecological balance and productivity. The amount of control must be balanced between the costs involved and the prospect for success. Components of this category include: (1) emphasis will be placed on containing and preventing further spread of the infestation; (2) highest priority will be given to "breakouts" from the infested area and along rights-of-

way or adjacent to private property; and (3) biological agents, when and where available, will be emphasized on main infestations when the agent demonstrates practical effectiveness against the weed.

Program Design Features

To give further definition to the Bureau's program, and recognizing that the available techniques carry different costs, efficiencies and environmental risks, the decision adopts the program design features from the EIS (Appendix I and Chapter 1) for deciding upon and governing use of a particular technique. In stating the design features, the agency does so to make personnel charged with implementing the program aware of the concerns and

constraints about using different means. the design features are to strengthen and supplement the judgement of qualified agency professionals who have on the ground knowledge and familiarity with local conditions and needs.

Four chemicals are authorized for use under this decision. They are 2,4-D, picloram, dicamba, and glyphosate. Other or new herbicides could be proposed for use in the future, but before their use, all required environmental analysis, including a hazard assessment similar to that in Appendix K of the EIS, will be conducted and appropriately documented.

The Bureau will use the herbicide to which the targeted weed species is most susceptible and will be of lest detriment to non-target vegetation.

The chemicals may be applied individually or in combination. Glyphosate, picloram, dicamba and 2,4-D will be applied only when in accordance with the Environmental Protection Agency's label and registration restrictions. All safety requirements and project features described in Appendix I of the EIS will be followed. All application methods may be used for each herbicide except glyphosate; it will not be applied aerially.

Conditions indicating preference for a particular method of application are as follows:

- Applications using backpack spraying, hand wiping and cyclone broadcast spreading (granular formulations only) will be used in areas not accessible by ground vehicles. Treatment area will generally range in size from individual plants to a few acres.

- Applications using a vehicle mounted boom or handgun will be used in areas readily accessible by vehicle. Booms are used to treat continuous weed concentration areas (i.e., along rights-of-way) while handguns are used to treat concentrated spots.

- Aerial applications will be accomplished using helicopters to treat larger contiguous areas, but normally not exceeding 100 acres in size.

Minimum buffer strips will meet or exceed state-mandated standards for all herbicides applied.

- In aerial applications a 500 foot unsprayed buffer strip will be left next to inhabited dwellings unless waived in writing by the resident. A buffer strip of 100 feet will be left next to cropland and barns.

- Boom sprayers will not be used within 25 feet of water bodies.

- Granular formulations will be applied no closer than 10 feet from the high water line of streams and other water bodies.

- Contact systemic herbicides wiped on individual plants may be used up to the existing high water line.

Wind velocities for chemical applications of herbicides must be 10 mph or less in all instances. Where aerial applications of liquid herbicides are utilized, the wind speed must be 5 mph or less. Where vehicle and hand applications of herbicides are used, the wind velocity must be 8 mph or less except in riparian areas where the wind speed must be 5 mph or less.

Spray nozzles are designed for aerial and ground vehicles spray equipment to produce droplets large enough (200 microns or larger) in order to limit the amount of drift. Aerial application equipment will normally operate with a boom pressure of 20 to 35 pounds per square inch, unless the product label specifies a different pressure. Backpack application of liquid herbicide will occur with low nozzle pressure and within 2.5 feet of the ground surface. Applications of granular formulations through use of broadcast spreaders occur from about 3.5 feet above the ground.

Four major methods of manual and mechanical control are authorized for use under this decision. These are hand pulling and using hand tools, tillage, mowing and controlled burning.

- Hand pulling and using hand tools to remove noxious weeds may be used when no other

means is available to control or eradicate the targeted noxious weed.

- Tillage, either by burial or disturbing the root system, to control or eradicate noxious weeds may be used under these circumstances:

  - slope does not exceed 10 percent.

  - nontarget species adversely affected represent an insubstantial amount of vegetation cover or forage for wildlife.

- Mowing may be used to control or eradicate noxious weeds under these circumstances:

  - the targeted noxious weed lacks rosettes or rhizomes and fails to produce seed heads close to the ground.

  - the targeted noxious weed is easily accessible by vehicles.

- Controlled burning may be used to control or eradicate noxious weeds under these circumstances:

  - the targeted noxious weed represents the vast majority of plants in the treatment area.

  - the burn is in accordance with BLM's Fire Management Policy (BLM Manual 9210).

  - the burned area can be rehabilitated to prevent erosion and resource degredation.

  - burning permit, when required, must be obtained.

Biological agents will be considered for use where they have demonstrated practical effectiveness in controlling the target noxious weed species. This does not preclude the use of biological agents from an experimental standpoint.

Each biological agent must be cleared for use on the targeted noxious weed as required under Executive Order No. 11987 (May 24, 1977). The following conditions are the most favorable for successful biological control.

- The biological agent is highly selective and will only affect the weed species intended for control.

- The mobility of the biological agent is sufficient to allow spread among the targeted weed community.

- The development of populations of biological parasites should be able to overtake the population of the target weed species.

- Biological agents used in a particular area or region of the targeted noxious weed should be able to adapt and be capable of surviving and reproducing.

Mitigation Measures

A number of mitigating measures which exceed standard BLM requirements, have been identified in the Environmental Impact Statement and are adopted by this Record of Decision. The program design features just announced also can be thought of as mitigating measures. In addition to the measures governing chemical treatments announced in the project design feature section here and the EIS, the following provisions also apply.

1. Due to the low no observable effect level (NOEL) for reproductive effects from Dicamba, female applicators will be restricted from working with Dicamba.

2. Due to the lowered margin of safety for the mixer loader from accidents, the mixer loader will wear a full length apron, face shield, rubber gloves, and liquid repellant footwear during the mixing and loading operation.

3. To prevent gross errors in the field in mixing, regular testing on field calibration and calculation will take place.

4. Due to the remote nature of the treatment areas, sufficient clean water will be available on the sprayer mixing and project sites to assure the opportunity for workers to wash off any chemicals splashed inadvertently onto skin.

To reiterate, all chemicals will be applied only when it is in accordance with EPA standards specified on the herbicide's label.

Monitoring and Studies

Table 1 summarizes the major monitoring activities which will be conducted under the decision. The purpose of the monitoring plan is to ensure that implementation occurs as planned and to ascertain the effectiveness of project design features and mitigation measures in meeting planned objectives. Information gained from monitoring will also be used to develop an improved data base from which to build future plans.

Much of the monitoring will be accomplished through normal operating procedures such as contract administration and staff review. Special systems have been developed to measure the biological and physical impacts of plan implementation. For example, control effectiveness will be monitored by post-treatment surveys designed to measure the actual effectiveness of a treatment or combination of treatments. When appropriate, monitoring will include recommendations for additional treatment and/or site rehabilitation.

Implementation and Additional Analysis

This Record of Decision is the next followup program step after completion of a final EIS. The process includes selection of the best alternative, or combination of alternatives, which in this case is Alternative 1. The decision becomes effective upon signature and issuance of this ROD, and BLM will proceed to implement the decision.

The EIS is a regional programmatic statement for controlling noxious weeds on BLM-administered land in Idaho, Montana, Oregon, Washington, and Wyoming and is intended to guide this program for the next 10-15 years. Site-specific environmental analysis and documentation (including application of categorical exclusions where appropriate) will be accomplished at the district level on proposed weed control plans. During site-specific analysis and documentation, public involvement will occur in accordance with the CEQ Regulations for implementing NEPA. Interdisciplinary impact analyses will be based upon this and other EISs, such as resource management plan, timber management plan, and grazing management plan EISs.

If analysis finds potential for significant impacts not already described in an existing EIS, another EIS or a supplement to an existing EIS may be required.

Table 1. Monitoring Plan

Monitoring Element	Method	Frequency	Characteristics Evaluated
Pretreatment Survey	On site visual inspection	Each treatment area	Species present, density endangered species present, control options, method chosen
Post Treatment Survey	On site inspection	Each treatment area	Effectiveness, need for retreatment, corrective measures or mitigation
Pesticide Use Proposal	Review of proposal and EPA registration by authorized certified applicator.	Prior to any herbicide application	Proposal compared to EPA registration requirements and ROD compliance
Water Monitoring Samples	Pre and post treatment water samples when program is near potable sources and could get into water.	As needed	Potential water contamination
Coordination Monitoring	Weed management plans submitted to Washington D.C.	Yearly	Coordination of plan
Biological Establishment	Survey of biocontrol agents release and establishment	State/District yearly	Establishment, effectiveness, and rate of spread of biological control agents.
Threatened and Endangered Surveys	Survey for T&E species prior to action	Each project	Presence of T&E species
Cultural Resource Surveys	Survey for archeological and historical resources	Each project which involves surface disturbance	Presence of cultural resources

Appendix 1-C. Key Sections of 1992 *Record of Decision on the Western Oregon Program - Management of Competing Vegetation Environmental Impact Statement*

The Decision

In managing competing and unwanted vegetation, the BLM's Decision is to combine features from the eight original alternatives to implement integrated vegetative management, emphasize a preventive strategy, reduce reliance on herbicides, and maintain the flexibility to potentially use all available treatment options in western Oregon. The Decision provides western Oregon-wide program guidance for the vegetation management program in a manner that is flexible for addressing site-specific variables occurring in the resource areas in the Cascade, Coastal and Klamath Provinces in western Oregon.

The BLM has given considerable analysis to the formulation and selection of the Decision features, weighed the risks associated with its implementation against the risks and severity of possible adverse impacts, evaluated public comments, consulted with professionals including accredited toxicologists, analyzed the process involving the USFS mediation document and their implementation guide, solicited public input on the FEIS, and released a draft ROD for public review and comment.

As the FEIS provided, the Decision combines features from the original alternatives in the FEIS, identifies a vegetative management process, specifies project design features and mitigating measures. The Decision emphasizes planning and monitoring, employing a preventive strategy, and reducing reliance on herbicide use.

Important distinctions specific to this approach are as follows:

- A judicious approach to vegetative management through systematic (sequential) program and site-specific planning and analysis where vegetation manipulation is expected to be needed.

- Development of action thresholds for plant communities with the intent of defining conditions that trigger potential needs for corrective treatments, anticipating competition problems, and assisting in monitoring activities. Involves verifying appropriate thresholds for local conditions and effectiveness of the prescription and techniques.

- A specified limit on yearly potential herbicide acreage available to reduce reliance on herbicides.
- Pursuit of adequate funding to make alternative treatments feasible.

- Recognition that herbicides, their formulations, and application techniques vary widely in their potential health effects, and that these decisions should be made on a site-specific basis with the risks of each method and their potential exposures being an important part of the Job Hazard Analysis and risk assessment.

A cap is placed on herbicide treatment in western Oregon in any one year; it will not exceed 8,800 acres. This Decision will retain the current emphasis for the BLM to continue its search for nonchemical methods of vegetative management when control is needed.

Another important part of the Decision is the acceptance of the qualitative risk assessment of BLM Appendix L done by the University of Washington (USFS 1988 FEIS, Appendix H), which was reserved in the FEIS until development of the Final ROD. Acceptance of the qualitative risk assessment signifies its incorporation into the FEIS and this ROD. This qualitative risk assessment addresses the quality of the data underlying the quantitative risk assessment.

The potential impacts of the Decision are within the scope of impacts discussed in the FEIS for the eight alternatives and the significant aspects of their environmental consequences.

Scope of the Decision

This FEIS and ROD apply to all BLM-administered land in the Coos Bay, Eugene, Medford, Roseburg, and Salem districts, and the portion of the Lakeview District previously within the Medford District prior to 1987. Further, the decision applies only to the portion of each activity that pertains to management of competitive and unwanted vegetation. Excepted from the decision is noxious weed control which is analyzed in a separate document, the Northwest Area Noxious Weed Control Program EIS (1986).

The Decision approach is to emphasize the use of prevention and natural processes to manage compet-

ing and unwanted vegetation. The decision applies to vegetation management planning and control activities, and sets guidelines and standard operating procedures for implementing such programs.

Treatment options available for consideration in the integrated management program include biological, manual, prescribed fire, mechanical, and chemical methods and techniques. In forest land management programs, these treatments are often essential for the establishment and maintenance of desired plants and for achieving good growth rates of desired vegetation to meet management goals. While controlling competition is key to both of these objectives, the manner in which adequate control of competitive vegetation is achieved varies. It is the variability, need, and manner of manipulation to ameliorate harmful competitive or unwanted vegetation that must be identified, analyzed and communicated on a site-by-site basis.

Planning and implementation of activities on a site-specific project basis will be done according to the NEPA process, and correlated with guidance set forth in this FEIS/ROD and approved land use plans. Site-specific projects may be planned and analyzed on either an individual or group basis.

General Provisions

The focus is two-fold: (1) To prevent or minimize the need for future vegetation management or corrective action and also subsequently the need for later treatments, and (2) To emphasize the use of preventive and natural processes.

The Decision is designed to protect human health and promote long-term productivity of the forest ecosystem while meeting the goals and objectives of management plans for such activities as timber production, habitat management, and maintenance of both transportation systems and recreation sites.

It combines a number of features from the eight original alternatives when corrective action is needed, minimizes impacts on air quality from prescribed fire, and reduces the potential for adverse human health effects.

To facilitate ongoing public involvement, the Decision provides for an interactive review of the vegetation management process throughout planning until project implementation. A public consultation process is also defined.

Guidelines for implementing the Decision are as follows:

- *Ecological relationships will be emphasized in designing program activities to meet land management objectives (such as timber harvest, roadside maintenance, wildlife habitat restoration).*
- *Human health risks to the public and workers will be evaluated to determine major design features.*
- *Where prevention is no longer a viable option, effective early treatment and alternatives to herbicides of special consideration are to be given priority.*

Vegetation Management Process

Definite steps recognized in the vegetative management process are as follows:

Step 1
Site analysis determines site conditions and potential needs for treatments according to objectives for the site.

Step 2
Strategies are evaluated to select the best planned course of action to implement a preventive approach, in the long term at a minimum.

Step 3
Project design for proposed treatment is developed which includes mitigating measures, public involvement, risk management, monitoring, and predicting of vegetation response.

Step 4
Vegetative management action implemented.

Step 5
Monitoring initiated to determine if course of action taken was effective and if further action is needed to promote the preventive approach.

Important Concepts to the Process

Concepts integral to the vegetation management process for the preventive approach include Integrated Pest Management, Prevention, Thresholds, and

Scheduling of Detection and Action as described in the following sections.

Integrated Pest Management (IPM)

"IPM is a systems approach to reduce pest damage (competitive and unwanted vegetation) to tolerable levels through a variety of techniques, including natural predators and parasites, genetically resistant hosts, environmental modifications and when necessary and appropriate, chemical pesticides." (BLM M-9220) For clarity, the decision expands the IPM definition in the FEIS glossary to reflect the generic definition. Further, for consistency, this definition will be used in all BLM western Oregon vegetation management planning and implementation.

IPM generally relies upon a combination of strategies, treatment options and techniques as preventive and corrective defense mechanisms against competitive and unwanted vegetation. When initiated early IPM can avoid vegetative management problems and, when needed, employ a variety of methods and techniques.

The BLM recognizes that the success of IPM is dependent upon several factors: knowledge of vegetative management strategies; a broad range of specific technical skills; planning, monitoring and implementing of multiple interactive steps over a fairly long time frame; potentially-high initial capital investments (e.g., mowers in roadside vegetative control); and consistent funding. Without the development of a vegetative community strategy, and without the planning that considers both single and sequential steps and treatment options, it is common for timing to be short between problem identification and action, and for there to be a lack of the available skills, workmonths, and funding to achieve the objectives. In the latter instances, and when unexpected situations occur, corrective or rescue actions are necessary to meet management objectives; IPM is then limited to selecting control alternatives or no action.

In view of the importance of an effective IPM program to the prevention strategy, the BLM will strive to have appropriate resources available. The BLM will encourage research on specific forest ecosystems and continue analysis on a site-by-site basis, linking these necessary steps to implement effective IPM programs and enable vegetative manipulation that avoids or reduces competitive and unwanted vegetation to acceptable levels. The BLM will also continue to support research towards gaining a thorough knowledge of the requirements of competitive and unwanted vegetation, and of the needs and vegetative growth characteristics of desired vegetation. Any actions that are similar or cumulative should ideally be anticipated during project planning stages and used to determine both the need and timing for control efforts under an IPM program.

Prevention Strategy

A key to implementing the Decision is the major emphasis on prevention as the priority strategy being accomplished through planning, to identify and take advantage of any situations where competitive or unwanted vegetation may not interfere with objectives, or to reduce the need for corrective actions.

In the context of the Decision, the term "prevention" will mean "to detect and ameliorate the conditions that cause or favor the presence of competing or unwanted vegetation in the forests. Prevention is in contrast to treatment, which refers to activities for controlling or eradicating infestations of competing or unwanted vegetation. It also should not be confused with early treatment, which refers to activities for controlling or eradicating existing, small infestations of competing or unwanted vegetation before they interfere with the agency's objectives for managing that area or adjacent lands." (USFS, Med. Doc., 1989.)

Emphasis is on prevention and then early action if action is needed. Other strategies include no action, correction, maintenance, and rescue and restoration. The potential for prevention or another strategy to achieve the goals for a given site will be analyzed prior to commencing any sequence of treatments.
The concept of prevention as a planned course of action in forest management has continued to develop and gain emphasis during the past decade as an accepted vegetative management strategy. It was a scoping issue in 1982 at which time it was proposed that such practices be considered under all alternatives and used whenever feasible.

Thresholds Concept

Determining damage and action thresholds is an important part of determining the need for action during the vegetation management analysis process. Thresholds are a measure of the degree or level of competition which depletes environmental resources to the disadvantage of a desired plant.

The appropriate timing of vegetation manipulation should involve determining both damage and action thresholds for control of competitive and unwanted vegetation. Damage thresholds refer to the levels of

vegetation abundance where there is a marked decrease in rate of the desired plants' survival and growth.

There appear to be two separate thresholds: one for tree survival and establishment, and another for growth maintenance and release. A survival damage threshold may have a competitive vegetation density level many times greater than the levels desired for optimal growth (free-to-grow), at least for short periods. Also, adequate growth often infers far less than that for "free-to-grow" status.

Because plant communities are a complex aggregation of plants and animals, the thresholds need to be identified and tested for efficacy and dose response at the plant community, or on a more localized level, and over various time periods including periods of drought and adequate moisture. Variance of floristics, dominance, growth habits, and succession from site-to-site may indicate a need for intensive vegetative control in some locations and during some time periods, yet very little control in other years and locations. Meeting the management objectives and maintaining forest health for one or more similar sites is the key to determining thresholds and selecting a vegetative management approach.

Determination of competitive thresholds give managers a better analytical approach in making choices about treatment need, treatment method, technique efficacy, and seedling performance on similar or comparable sites. It will also help determine the appropriate degree of tool intensity necessary to attain an expected level of plantation performance (Wagner et al 1989; Radosevich, et al 1990 New Zealand). To emphasize effective preventive strategies, the BLM will continue developing, modeling, testing, and evaluating appropriate thresholds for action on a plant or ecological community basis.

Scheduling of Detection and Action

Because planning is essential to the prevention strategy, it is necessary to document site evaluations, develop a time-line for the occurrence of expected problems if action is prescribed, and use a pretreatment survey to verify if action is expected to be implemented. Strategies such as planning to avoid certain competitive conditions, developing alternative silvicultural schemes, and taking early action will generally minimize damage and often preclude further treatment.

The time to detect and ameliorate unwanted or competitive vegetation conditions is early in the project planning stages, before growth loss of desired vegetation becomes serious, and before major corrective action is required. This determination of need can occur during regularly scheduled surveys, project analysis, and young stand monitoring.

Priorities

Based upon the foregoing, BLM establishes the following vegetation management priorities in selecting and designing treatment methods to achieve site-specific management objectives:

Priority 1 - Plan at the earliest opportunity to detect and ameliorate conditions that cause or favor the presence of competitive and unwanted vegetation. Also, review data from past treatments of comparable sites to determine potential need and treatment effectiveness.

Priority 2 - Search for, and use, effective nonchemical methods of vegetation control and selective treatments when feasible. Manipulate the potential vegetation and timing of any prescribed actions to attain the desired conditions and minimize the overall need for control of competitive vegetation.

Priority 3 - Use herbicides only after fully considering the effectiveness of all reasonable treatment options, combinations with various methods of manipulation, and herbicide environmental effects, safety, human health risks (exposure), specificity, effectiveness, and their relative costs of implementation. This includes reducing both use levels and exposures to herbicide by employing application techniques and efficient formulations to improve effectiveness and selectivity, minimizing size of treatment areas, and where feasible combining the herbicide option within a mix of other treatments and methods for a program of integrated pest management.

Because not all potential problems develop and many that develop do not reach a threshold level, it may be appropriate for managers to defer action on some units or portions of units to see if problems do develop or if the potential is serious. Generally, however, whenever treatment is needed it is best to take the earliest available action identified to maintain adequate conditions and growth for desired plants. The earliest action often is to manipulate or reduce the problem vegetation while that vegetation is small and easy to treat.

It may not always be necessary to collect new data to respond to issues and evaluate alternatives strategies. Applicable information may be found in existing site records, or from other comparable sites.

Herbicides Available for Use

When herbicides are considered, BLM could use formulations that contain one or more of the following herbicides: asulam, atrazine, 2,4-D, dicamba, glyphosate, hexazinone, picloram, and triclopyr. These herbicides were analyzed for use in the FEIS, and in Appendices D and H which are incorporated into the BLM's FEIS. Use of these chemicals is subject to special mitigation measures summarized in this ROD, and the guidance provided in the Herbicide Profiles.

The selection of herbicides to use, along with the guidance provided in this ROD, recognized that some data gaps exist (see Chapter 6). However, in general, the data gaps occurred where initial experiments did not meet current standards. Also, see Appendix D which was prepared to address data gaps.

Herbicide Formulations and Inert Ingredients

The BLM encourages the use of the least toxic inert ingredients available and requires the disclosure of data necessary to determine conditions of safety before a product can be used.

The reason for this precaution is that most chronic tests of herbicides do not use the full formula, but test only the active ingredient. A high proportion of these formulations have "inert" ingredients which often are neither chemically nor biologically inert and may have substantial toxicity themselves (see Appendix H).

Accordingly, only those formulations that do not contain inert ingredients on EPA's List 1 and 2 will be used, unless the risk associated with the listed inert ingredients is evaluated and the formulation found acceptable. In addition to considering EPA information to judge and select the least hazardous inert formulations available for use, BLM will use publicly available manufacturers' data and request acknowledgement about List 1 and 2 inert ingredients.

Two inert ingredients of concern—kerosene and diesel oil (both petroleum distillates)—have been reviewed by the BLM. It was determined that kerosene and diesel oil would not add significantly to the potency of the formulations. Their use will, however, be subject to the following guidelines:

- Kerosene will not be used in herbicide applications except as an inert ingredient in the formulations of 2,4-D (Esteron) and triclopyr (Garlon 4).
- Diesel oil will not be used in herbicide applications as a carrier; however, diesel oil may be used as an adjuvant (not to exceed five percent of spray mixture) (USFS, Region 6 FEIS).

Herbicide Use Restrictions and Precautions

An annual cap of 8,800 acres is placed on herbicide use during the effective life of this FEIS to reduce reliance on herbicides. Herbicides will be used only when other methods are ineffective, or will increase project cost unreasonably. This decision does not infer that herbicides are ineffective or costly. Rather, this decision to limit herbicide use arises from a concern among many people, including professionals, about the use of herbicides.

Further, when selecting a herbicide, the BLM will use only those herbicides for which herbicide profiles are, or will be, available.

Although markedly less toxic than insecticides, herbicides must be handled and applied with care. This need for caution is the reason that EPA registers herbicides, the BLM conducts risk analyses for program and public risk and worker job hazard analysis on site-specific projects. Another precautionary measure in the use of herbicides is that the personnel involved in planning, applying, supervising, and reviewing herbicide applications must be certified.

Precautionary measures BLM will employ relative to all herbicide use include conducting periodic literature reviews by accredited toxicologists, providing information sheets for each of the herbicides approved for consideration, strictly adhering to label regulations, and thoroughly training its applicators in safety precautions as well as proper application technology.

Specific protective measures for herbicide use are provided in Chapter 5 and Appendix B. It should be recognized that further review may show that expanded use of herbicides is justified, or that further prudence is appropriate.

Herbicides of Special Consideration

Due to their known or uncertain adverse human health effects the herbicides 2,4-D, asulam, and atrazine will be placed in a Special Consideration Category requiring special precautions, consideration and analysis whenever they are proposed for use. This will include ensuring that all feasible effective alternatives are considered and protection measures such as aerial

restrictions, worker protection and posting and controlling access have been implemented. (See the section on Effectiveness of Practice in Meeting Objectives for a related discussion on selection of herbicides of special consideration.)

Asulam, atrazine and 2,4-D have either incomplete or highly conflicting information about their human health effects. All three have cancer potency values noted in the FEIS, as if they are associated with or are carcinogenic, and recent toxicological data continue to recommend a cautious and conservative approach. Atrazine has controversial and potentially high risk reproductive MOS values, especially for workers and is a confirmed ground water contaminate.

Due to the above, the application technique and placement of atrazine and 2,4-D will require additional controls. A risk management strategy for the public and a job hazard analysis for workers will be developed to assure high risk exposures do not occur.

Program Implementation

Program Design

Implementation of the vegetative management program has two parts: standard operating procedures and project design features. The standards are a list of important measures that are applied on a regular basis for the various types of vegetation treatment. Project design features are intended to ensure the proper and safe implementation of treatment methods, and are selected based upon site-specific analysis. Analysis of specific treatment areas may result in modification of the project design features, or the identification of others, to provide adequate protection to nontarget organisms and human health. Standard operating procedures are listed below, followed by a list of common project design features.

Standard Operating Procedures

Strategy

Use prevention and natural processes as the preferred strategy to manage competing and unwanted vegetation. Conduct planning and monitoring to anticipate, and take steps to avoid, potential vegetation management problems. When needed, plan corrective actions to occur early and timely as compatible with a long-term preventive strategy and natural disturbance and recovery pattern in the site-specific area.

Safety

Always consider the safety of both the general public and workers. This includes determining the degree of exposure, hazard and risk posed by various vegetation management treatment methods for forestry workers, forest users, and nearby residents.

Program-wide risk assessment will be conducted by the program leaders prior to any treatment where there is potential for direct or indirect effects on human health to evaluate human health exposure to any hazardous substances and injuries. Keep in mind that this preliminary analysis is about generalities, not site-specific instances. Low-risk or low exposure methods will be sought for implementation to minimize public exposure to injurious situations.

In general, the risk assessment process will involve three evaluation components: Hazard, Exposure, and Risk. These components and their interrelationship are described below:

Hazard Evaluation: Identify harmful characteristics of the proposed vegetation management methods.

Exposure Evaluation: Estimate the kinds and levels of exposure and doses likely to result from potential exposures under routine, worst case, and accidental scenarios.

Risk Evaluation: Combine hazard information with dose level exposures to predict the health effects under the given conditions of exposure.

These evaluations are conducted for two groups of people: the general public and the occupationally exposed. A Job Hazard Analysis (JHA) is used to anticipate site-specific human health effects. For the general public, evaluation is done for single exposures and exposures over a 30-year time period.

When considering potentially harmful situations in site-specific evaluations, estimate exposure by identifying: (1) who is being exposed, (2) when the exposure will occur, (3) where exposure would occur, and (4) the amount, duration, and frequency of exposure. These estimates should then be compared to the average conditions found in the FEIS risk assessment and used to determine design and adequacy of mitigating measures.

The "amount" of exposure is the actual quantity or level of a substance that comes in contact with an individual. "Duration" is length of contact, and "frequency" is the number of encounters with the substance. Other

factors to consider in exposure analysis include proximity (distance) to human habitation, water source, or potential food stuffs, and recreation use patterns, weather conditions, and access to site.

All employees active in vegetation management will be trained in the safe use of prescribed fire, cutting tools and equipment operation, herbicides, and other techniques. Proper protective clothing will be worn by employees as prescribed in use manuals for methods such as chemicals and fire (BLM Manual H-1112-1).

The project design of prescribed fire will include consideration of such measures as smoke management, reduction, avoidance, and scheduling to protect recreationists and rural residents from smoke exposure (see Appendix B).

Information packets containing data on the potential hazards of chemical treatment methods will be made available to employees, the public, and contractors (see Appendix B and Herbicide Profiles, Appendix C). As new data becomes available, the information packets will be supplemented.

Worker Protection, Public and Occupational Accident/Incident and Illness Reporting

All workers who use or are exposed to hazardous tools/equipment including herbicide applications will utilize protective clothing and equipment that meet the specifications of the BLM Safety Manual, labels approved by the Environmental Protection Agency (EPA), and/or BLM risk analysis. (See worker protection in BLM Manual 9022; Manual Handbooks 1112-1, Chapters 14-16; and H-9011-1.)

A Job Hazard Analysis will be used for monitoring the impacts on human health. In addition an incidents-accidents system will be used for reporting employee, contractor, volunteer and public. In addition to injuries and illnesses, the system will be used to report vehicle accidents, property damage and fire losses (485 DM, Chapter 7 and BLM H-1112-1). Forms CA-1 and/or CA-2 for occupational exposure or injury and DI-134 for all reported accidents, incidents, and illnesses will be used.

The Report of Accident/ Incident (DI-134) will be used additionally to report health effects associated with vegetation management projects for forwarding to the Program Coordinator to be entered the Safety Management Information System (SMIS), reported to OSHA and used internally for trend analyses. The Federal Record System retains records for any employees exposed to toxic substances or harmful physical agents for 30 years (29 CFR Ch XVII 1910.20). Contractors will be required by stipulation to complete a DI-134 for each employee. The DI-134 along with the Project Accomplishment Report (herbicide use report) will list date of project work, specific assignments, herbicide formulation (if any) and ingredients used, safety or health hazards, and any health complaints.

Public Involvement

Determine the need or level of public involvement by reviewing the type of management actions. BLM management actions are divided into five categories (Manual 1790-1):

- Exempt from NEPA. Includes Congressional, emergency and rejected proposals.
- Categorical exclusions. Specifically identified actions, not restricted by exceptions list, that do not require an environmental assessment (EA).
- Actions already covered by an existing FONSI and EA, or EIS. Timber sales and multi-year EA. (Noxious weed control is in a separate EIS.)
- Actions covered by an EIS and require an EA.
- Actions that require an environmental impact statement.

Public involvement is to be encouraged and facilitated in vegetation management environmental analyses. The level and degree of public involvement will depend on public interest, type of analysis performed, and the method of treatment proposed.

The BLM will provide public notice whenever a site-specific project is considered to prevent or treat competing or unwanted vegetation with any proposed measure of treatment. (Excepted are actions exempt from NEPA or covered within a categorical exclusion.)

Public notice will precede the screening stage of the environmental analysis of the project under NEPA guidelines. Notification methods will include, at a minimum, a notice in local newspapers. Additional standard methods may include posting of public notices in the state office, district office and resource areas; and in other public rooms used to distribute public information concerning proposed Bureau actions. Notification lists maintained by the program

coordinators will be used in notifying the interested public of any proposed use of herbicides.

In case of an action with effects primarily of local concern, the notice may include: areawide clearing-houses, notices to potentially interested community organizations, direct mailing to owners and occupants of affected property, and posting of notice on and off site in the area where the action is located. The level of controversy will determine the need for notices and posting. Herbicide use areas will be posted. Notices must indicate procedures for interested persons to get information or status reports.

The public will be notified of the availability of the EA and FONSI (Finding of No Significant Impacts additional to those not already analyzed in a program's EIS). The manager responsible for authorizing the action determines the appropriate means of public notification and ensures its availability based on the extent of concern and interest in the action. All individuals or organizations that have requested notification on a specific action should be notified by mail where feasible. When considering the use of herbicides of special consideration the potential use will be made known to the public at the earliest practical time.

Before a decision is made to proceed with controversial treatment methods such as herbicides, the public will be invited to review and comment on the site-specific analysis of the project. When a decision is made for a site-specific project the public will be promptly notified of the final decision whether it is to proceed, or not to proceed.

Environmental analysis and public involvement will normally occur as indicated in four levels of project screening:

1. Screen unit for need of action, and set priorities. Where: Reforestation of timber sales or wildfire areas. Actions where no herbicides are proposed for use and the proposed treatment qualifies for categorical exclusions. Examples of current categorical exclusions:
   - Precommercial thinning
   - Manual maintenance and release.
   - Paper mulching and spot scalping.

2. Screen for need and complete environmental analysis. (Outside exclusions or controversial.)
   - Mechanical site preparation

3. Screen for need, complete environmental analysis, inform downstream water users.
   - Biological and grazing methods.

4. Screen for need, complete environmental analysis, inform downstream water users, notify adjacent property owners, provide public notification when there is a probable public exposure, and request response from those individuals who are hypersensitive. This screening should be done when proposing projects for herbicides and prescribed fire to determine appropriate risk management measures.

Considerations for public involvement when proposing vegetative management, regardless of type of treatment, is summarized on Table 5-2.

Project Design Features

Review site-specific conditions to determine which of the following project design features are needed.

Notify Private Landowners and Downstream Water Users

Residents and adjacent landowners within 0.5-mile of proposed treatment sites who likely could be directly affected by chemical drift, smoke, food or water contamination, or an accidental spill will be notified prior to any chemical, broadcast burning, or biological application, and actions will be taken to minimize any potential effects.

Minimum Width Buffer Strips

District guidelines as well as State water quality standards will be met by using buffer strips, contractual stipulations on method and techniques, and other site-specific criteria. Concerns to consider in planning and selecting a vegetative management strategy, treatment, or technique and in determining site-specific project design include stream bank stabilization, sediment rates, temperature, sensitive vegetation and other organisms, and bacteria counts. Buffer strips will meet resource management plan criteria and site-specific conditions.

When herbicides are used, the minimum buffer strips listed below will be reserved adjacent to class I and Important Class II (BLM order III and above) streams, lakes and ponds, pasture and agricultural lands. These minimum buffers will be in accordance with current interim protection requirements of the Oregon State Forest Practice Act requirements and definitions, or as specified on the herbicide use label.

Minimum Buffer Widths for Waterways When Herbicides are Proposed for Use

Application Technique	Minimum buffer Width
Manual wipe-on	High water mark
Manual	10 feet
Vehicle	50 feet
Aerial (Flowing stream)	100 feet
Aerial (Lakes and ponds)	200 feet

Applications of atrazine, a persistent chemical, in areas having shallow water tables or where aquifers are located in alluvial deposits along major streams, will be subject to guidelines for above-ground waterway buffers.

For mechanical and burning treatments, the minimum buffer along streams will be 25 feet.

Residences, Domestic Water Diversions and Agricultural Areas

Minimum buffer strips near residential, domestic water, and agricultural areas is determined by the site-specific application technique.

For aerial application of herbicides in areas adjacent to residences, a minimum buffer strip measuring at least 600 feet wide will not be treated unless a written waiver is provided by the landowner. For domestic water diversions in a drainage where aerial herbicide application is used, the minimum buffer will be 200 feet. Additional risk (exposure) assessment may be required for aerial herbicide treatment within 600 feet of a residence.

Aerial application of herbicides of special consideration (e.g., 2,4-D, asulam and atrazine) will be prohibited within 0.25-mile (1,380 feet) of residences.

For ground applications of herbicides, the minimum untreated buffer reserved between treatment areas and residences will be 100 feet.

Local conditions may require an expansion of the minimum widths. Some examples of site-specific factors that may necessitate additional buffer width include mode of transport (direct application, drift, and water flow), adjacent topography, buffer vegetation structure and functions, and nearby agricultural areas or gardens.

Other Sensitive Conditions

Buffer strips may also be recommended for wildlife habitat, scenic corridors, and other concerns as identified in land use plans.

Monitoring and Evaluation

Monitoring of the western Oregon vegetation management program will be done in accordance with established BLM procedures as provided for in BLM Manual H-1734-1, land use plans, and as indicated below. The need and type of monitoring will be dictated by the nature of critical components in the site-specific treatment area.

General guidelines for monitoring are as follows:

- Monitoring is to be done annually at both the program-wide and site-specific basis, and for worker and human health concerns. The Program Coordinators will: (1) project three-year estimates of proposed methods and techniques, (2) describe whether management actions are making satisfactory progress toward meeting objectives to reduce reliance on herbicides and meet prescribed fire air quality goals, and (3) present criteria for meeting goals.

- Site-specific post-treatment monitoring will be conducted to aid future planning, and at a minimum will include:

  -Efficacy of treatment or no treatment.
  -Costs, both direct and indirect.
  -Analysis of mitigating measures, unintended effects, and accidents.
  -Estimate of degree of success.
  -Assessment of both short and long-term effects on vegetation.

- Water Quality monitoring will be conducted per goals in land use plans to meet or exceed Best Management Practices guidelines. Monitoring of the spray operation will be conducted to determine if mitigating measures are being observed, are effective in maintaining water quality, and are in compliance with state water quality standards and herbicide label requirements. The potential for contamination of aquifers used by fish, or for municipal water or irrigation, will be considered in site-specific environmental assessments.

- The program-wide assessment will consider:

  -How well strategy is meeting management objectives (site preparation, seedling survival, improving wildlife habitat, roadside maintenance). Include "no action" locations in comparisons.

  -Whether assumptions are correct and potential impacts are as expected.

  -Effectiveness of mitigating measures.

  -Impacts on other resources (i.e., wildlife, water, air).

  -How projected need for herbicide and prescribed fire treatments can be reduced.

  -Consistency with federal agencies, state and local governments.

  -New data that would require alteration of program.

- Recording and reporting human health concerns would be done to verify job hazard analysis and risk assessments and would include review of:
  -Exposure incidence.
  -Accidents.
  -Worker health complaints.
  -Recording of treatment methods, including for herbicides: the exact identity, formulation, manufacture, mixture and method of application.
  -BLM Herbicide (Pesticide) Application Record, and worker and public Reports of Accidents/Incidents or Illnesses (DI-134, CA1 or CA2) for vegetative management projects.
  -Names of personnel working on herbicide projects, their assignments and dates of actual work (29 CFR XVII, 1910.20)

- The Program Coordinator will be incorporate any new data that would require alteration of the program.

- Conduct young stand monitoring during standard stocking survey at intervals of one, three, and five years and record treatment effectiveness, or as a post treatment evaluation survey on a sampling basis to be filed with BLM Project Implementation (Herbicide Application) Records.

- Submit annual report to Oregon State and Washington Offices for herbicide usage describing the acreage, amount, usage, location, and use strength for each chemical used. Retain project records for three years.

The above monitoring, along with planning and providing "no action" units or portions of units will help to determine effectiveness and need for action as a baseline comparison. Through these actions, the BLM will be able to determine if the actions are giving the desired management results.

Appendix 1-D
Public Involvement

Summary of Scoping

Scoping of the Salem District Resource Management Plan/Environmental Impact Statement (RMP/EIS) began in September 1986, when a mailer was sent to a mailing list of some 600 parties, inviting them to identify issues and concerns for BLM to consider in the planning process. One open house was held by the district during the comment period, to help interested parties focus on the question.

With the comments received, the district's planning team and managers distilled a list of issues and concerns. The BLM defined an issue as a matter of controversy or dispute over resource management activities or land use that is well defined or topically discrete and can be addressed in the formulation of planning alternatives. In practice, issues are resolved by resource allocations and restrictions. Concerns, on the other hand, are generally not so well defined, or do not directly involve controversy or disputes over resource management activities or land use allocations, and do not lend themselves to formulating land use alternatives. Concerns are usually addressed by analysis and documentation in the RMP/EIS. Some concerns are not addressed by the RMP/EIS, as they are beyond the control of the state director, are unrelated administrative problems, or are not within the legal jurisdiction of BLM.

The issues and concerns identified are described in chapter 1. This list of issues and concerns was sent to interested parties in March of 1987.

Further scoping related to refinement of the issues and determination of a reasonable range of alternatives to address in the RMP/EIS. The latter facet of scoping was handled through the development of state director guidance for formulation of alternatives. The development of state director guidance for the RMP process is discussed in appendix 1-E. This guidance also directed a number of sensitivity analyses of the primary alternatives to address relevant management options that could not be effectively addressed in a manageable array of fully analyzed alternatives.

In public comments and internal discussions, there were a number of alternatives, or potential elements of alternatives, considered but eliminated from detailed analysis. These are summarized in the following discussions:

- Alternatives that would meet specified timber production target levels (e.g., one identified in a regional supply analysis or one that would maintain the level in existing plans). Such alternatives could be explicitly designed only with an optimization model. Early in the planning process, the BLM chose not to invest the many millions of dollars that would have been necessary to adopt and use an optimization model in its western Oregon planning effort.

- Alternatives that explicitly reflect the policies and programs of the O&C counties, and of the state. Until opportunities and tradeoffs are fully analyzed, such alternatives could not be formulated. At that point in the process, it was the BLM's intent to develop a preferred alternative consistent with those policies and programs to the extent they are consistent with each other and also consistent with federal laws and regulations.

- An alternative based on the assumption that FLPMA, rather than the O&C Act, was the predominant statutory mandate for management of the O&C lands. None of the initial set of alternatives was based on a specific real or assumed statutory mandate. The BLM believes that management under FLPMA falls within the range established by the initial set of alternatives.

- A no planned timber harvest alternative. The BLM considers such an alternative for all BLM-administered lands in western Oregon outside the reasonable range of alternatives. The counterpart of a no timber harvest alternative would be an alternative that would remove all merchantable timber over the life of the plan. Such a radical departure from sustained yield principles on either end is clearly outside the reasonable range of alternatives.

- Alternatives considering neither intensive management practices nor the allowable cut effect in setting an allowable sale quantity. The impact of foregoing these can be identified from the sensitivity analysis of the preferred alternative.

- An alternative which would forego slash burning; one that would forego use of herbicides. These activities and the options of foregoing them were addressed in BLM's vegetation management EIS (USDI, BLM 1989). This RMP/EIS is tiered to that EIS.

- An alternative that uses uneven-aged management as the predominant silvicultural system. In many locations that prescription would fail to meet reforestation standards, a violation of the sustained

yield mandate. Uneven-aged management is considered for use in stands where it would be economically and environmentally feasible and reforestation standards could be met.

- An alternative which excludes site IV lands from timber harvest. Such an alternative would not address any important environmental or resource management objectives better than options already being addressed.

- An alternative that maximizes timber production subject to the constraint of economic feasibility. Analysis of the economic feasibility of alternative A showed that such a constraint would negligibly affect the ASQ of that alternative.

- Alternatives which vary in size of spotted owl habitat protected for each nest site. In light of the Interagency Scientific Committee report and subsequent proposals by the U. S. Fish and Wildlife Service, the BLM concluded that such variation had little relevance.

- An alternative that would protect 110 spotted owl areas, as provided for in the 1987 revised BLM-ODFW agreement, was originally proposed by BLM. After the Interagency Scientific Committee report was released in 1990, this alternative no longer seemed relevant.

- An alternative that manages as VRM class II all lands inventoried as VRM classes III and IV. Such an alternative would only be logical if matched with the other goals of an alternative with a very constrained timber harvest base. This management option, intended to optimize protection of scenic values even on areas identified in inventories as low in scenic value, was felt to be too arbitrary to warrant its application as an additional contraint to alternatives that severely restrict timber production to emphasize more meaningful objectives.

- An alternative protecting a minimum of 1/4-mile-wide riparian management areas (RMAs) along third order and higher streams, class I streams and other waters; and maintaining and enhancing water quality at the highest level of water quality required for municipal use. Such an alternative would exclude almost all commercial forest lands from timber management. Such extensive RMAs would be far in excess of what is needed to protect water quality and riparian values. Thus, it was considered outside the range of reasonable alternatives.

Summary of Analysis of the Management Situation (AMS) Public Involvement

After the AMS was drafted and the AMS summary was completed in January 1991, the district made a concerted effort to inform the public about availability of the documents for review and comment. The scope of the effort is reflected in the following statistics:

- 75 copies of a preliminary AMS summary distributed to the public before, during and shortly after the first public meeting;
- 800 copies of the printed AMS summary distributed to the public; and
- 16 public meetings held in 8 communities in the district; 240 people participated in the meetings.

There were 399 public comment responses received, including 18 duplicate responses (identical content and signature) which were recorded only once. Not counting duplicates, there were 320 individual letters or postcards, 43 comment sheets, 11 form letters, 3 petitions, and 4 telephone interviews. The total number of signatures was 732. There were 2,638 individual comments, issues, and concerns stated in these letters and processed in the comment analysis.

The process used to record and analyze incoming responses included the following steps:

1. Assign an identification number to each individual response.
2. Make copies for coding and for management and planning team review.
3. Place original response in case file to be retained until after the resource management plan (RMP) is completed.
4. Read each response noting any comments requiring immediate attention, and refer to the appropriate resource specialists or area manager for response.
5. Record demographic information and input into computer database.
6. Code responses according to topic discussed, opinion expressed, and reason for the opinion.
7. Enter coded information into computer database.
8. Access database to obtain desired information.

Demographic information was recorded and analyzed to gain an understanding of places of residence, types of response, affiliations with a group or organization, and the number of signatures on each response. The demographic information was used to expand and refine the existing RMP mailing list and will assist in future public outreach efforts.

An analysis of all comments relevant to the AMS was completed. The purposes of this analysis were to summarize information and suggestions contained in the responses and to develop summary tables and reports. The reports allowed RMP writers and managers to: (1) identify respondents' concerns, opinions and underlying reasons, as well as new ideas and information; and (2) categorize these comments into an orderly summary sheet for decision makers.

Responses were received from 61 localities in six states (California, Oregon, Hawaii, Virginia, Washington and Wisconsin), Washington D.C., and England. The majority of responses were from localities most likely to be affected by RMP decisions. Respondents from five of these localities were by and large interested in only one issue specific to their locality. Respondents from Corvallis were primarily concerned with the Mary's Peak issues while respondents from Alsea, Tidewater and Waldport were mainly concerned with potential wild and scenic river designations in their area. The majority of letters from Sandy and Welches dealt with the potential Mt. Hood Corridor Special Recreation Management Area (SRMA) proposal. Respondents from the remaining localities discussed a wide range of topics.

The entire analysis and a more detailed summary are available for review in the district office.

Appendix 1-E. State Director Guidance for the RMP Process

According to Bureau regulations for preparing RMPs, "the State Director shall provide quality control and supervisory review, including plan approval, for plans and related environmental impact statements and shall provide additional guidance, as necessary, for use by District and Area Managers." "Guidance" means "any type of written communications or instructions that transmits objectives, goals, constraints or any other direction that helps District and Area Managers and staff know now to prepare a specific resource management plan."

Early in the process of concurrently preparing this RMP and five other RMPs which together cover all BLM-administered lands in western Oregon, the BLM State Director decided to develop comprehensive procedural guidance as planning critèria to assure consistent treatment of a variety of issues and concerns in the six plans. The intent to do this was conveyed to known interested parties in a mailer sent out by each BLM district office with planning responsibility on March 27, 1987. Suggestions for content of that guidance were solicited in the mailer.

There was limited public response, but that response, along with internal BLM recommendations, led to formulation of a proposed set of topics for State Director guidance. A mailer describing those topics were sent to the public for comment on August 11, 1987. Using further but still limited public comments, BLM modified its list of topics slightly and drafted Proposed State Director Guidance, which was sent out for public review by interested parties on May 13, 1988.

Although less than a hundred individuals and groups responded, many of the comments received were thoughtful and constructive, and addressed the proposals in depth. BLM undertook a substantial revision of many sections of the proposed guidance. This revision was done on a staggered schedule, to distribute the workload and provide timely guidance to the districts for each step in the process.

The first element of the guidance completed was Guidance for the Preparation of the Analysis of the Management Situation (AMS). This document summarizes important information about existing resource conditions, uses and demands, as well as about management activities and natural relationships. It provides the baseline for subsequent steps in the planning process, such as the design of alternatives and analysis of environmental consequences. The AMS also provides most of the data to be summarized in the "affected environment" chapter of the EIS. The AMS guidance prescribed minimum contents and table formats for the AMS for each plan. That guidance was essentially completed in October 1988, and slightly revised during 1989 and 1990.

A master glossary for the AMS was prepared as part of the State Director Guidance. It was completed in 1989, and later revised for inclusion in each Draft RMP.

The Guidance for Formulation of Alternatives was essentially completed in October 1990 but underwent modest revision during 1991 and 1992. A copy of the final version of this guidance is included in this appendix.

Two other sections, Guidance for Analytical Techniques Needed to Estimate Effects of Alternatives and Guidance for Use of the Completed Plan, were completed in July 1991, with slight modification of the former in 1992. Descriptions of complex analytical techniques have been appendicized to discussions of the relevant analyses in Chapters 3 and 4. The Use of the Completed Plan section was wrapped into the equivalent section of Chapter 2 of the Draft RMP/EIS.

The original draft guidance had two other sections that never became final. Guidance for the Executive Summary was dropped because the State Director's staff prepared that summary. Guidance for expressing consistency with plans, programs and policies of other agencies was never formalized, as BLM staff worked with state agencies and county planners until the Draft RMP/EISs were almost complete, on ways to express such consistency.

Guidance for Formulation of Alternatives

Introduction

The purpose of alternatives is to identify a range of reasonable combinations of resource uses and management practices that respond to planning issues and provide management direction for all resources. Five common alternatives will be addressed in each RMP, to provide a consistent set of distinct choices among potential management strategies.

A no change from the existing land use plan alternative will also be addressed. This is the "no action" alternative. In the other alternatives all existing land use decisions not found valid for continued implementation after 1990 (through an analysis summarized in the Analysis of the Management Situation), will be reconsidered.

Common alternatives that identify specific management actions along District boundaries will be consistent. Examples include elk management areas, spotted owl corridors or visual corridors.

This Guidance for Formulation of Alternatives may be modified later based on information identified in the districts' analyses of the management situation, or refinements that flow from the districts' site-specific development of common alternatives.

Goals and Objectives of the Common Alternatives

The purpose of the goal and objective statements for the five common alternatives (A through E) is to guide development of specific criteria. Each alternative, if implemented, is intended to achieve or meet its goal. Goal and objective statements focus on general direction of alternatives rather than technical points in issue-related criteria for the alternatives. In each alternative all resource management values would be accommodated to the extent consistent with the primary goals and objectives for that alternative.

Specific Guidance on Common Alternatives

The common alternatives would differ primarily in the way they allocate primary uses of lands (for example, lands allocated to intensive forest management, and lands allocated to protection of riparian zones).

The discussion on page 4 through part of pages 14 and 15 describes criteria for addressing each of the eleven planning issues in the formulation of the common alternatives. It also describes how land use allocations and management actions would vary in response to each issue. Within the specific constraints provided by the guidance for addressing each issue, the districts have flexibility to formulate the common alternatives as they consider appropriate to meet the goals and objectives of each alternative.

	Alternative A	Alternative B
GOALS:	Emphasize high production of timber and other economically important values on all lands to contribute to community stability.	Emphasize timber production to contribute to community stability consistent with the variety of other land uses such as fish and wildlife habitat, recreation, and scenic resources on O&C and CBWR lands. Give equal consideration to all resource values on public domain lands.
OBJECTIVES:	• Produce the highest sustained yield of timber on all suitable forest lands legally available for harvest. • Contribute to ecological functions important to timber productivity and to habitat diversity to the extent possible consistent with the allocation for timber production. • Manage threatened and endangered species habitat as legally required. • Provide Research Natural Areas and eligible Areas of Critical Environmental Concern to the extent consistent with the allocation for timber production. • Manage appropriate Congressionally designated areas to maintain and enhance their scenic values. • Meet legal requirements for protection of wetlands and water quality, to protect anadromous fish habitat and other relevant values. • Emphasize substantial developed and dispersed motorized recreation uses. • Find no additional rivers suitable for designation under the Wild and Scenic Rivers Act. • Make land tenure adjustments which enhance BLM long-term sustained yield timber harvest opportunities. • Provide no special management in rural (residential) interface areas.	• Produce a high sustained yield of timber on O&C and CBWR lands, and on public domain lands where nontimber uses and values are of lesser importance than timber production. • Contribute to ecological functions important to timber productivity and to habitat diversity using a system that maintains old growth and mature forest in large and small blocks. • Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern to the extent consistent with high timber production. • Retain existing Research Natural Areas (RNAs) and Areas of Critical Environmental Concern (ACECs). Provide new ones from eligible areas to the extent consistent with the emphasis on timber production. • Manage scenic resources in selected areas of high recreation use. • Meet legal requirements for protection of wetlands and water quality and provide moderate additional protection for anadromous fish habitat, other substantial streams, and other water. • Provide for a wide range of developed and dispersed motorized recreation uses and opportunities, to minimize conflicts among recreation user groups. • Find eligible river segments suitable for designation as recreational, if they are important and manageable, and designation would not cause adverse economic impact. • Make land tenure adjustments which enhance BLM long-term sustained yield timber harvest opportunities on O&C and CBWR lands, and which benefit a variety of uses and values on public domain lands. • Adopt appropriate special forest management practices on BLM-administered lands intermingled with or adjacent to rural interface areas zoned for most dense residential occupancy.

Alternative C	Alternative D	Alternative E
Provide timber production to contribute to community stability consistent with maintenance of biological diversity and the variety of other uses such as fish and wildlife habitat, recreation, and scenic resources on all lands.	Emphasize protection and reestablishment of spotted owl habitat, along with management and enhancement of other values such as dispersed nonmotorized recreation opportunities and scenic resources, while sustaining some timber production.	Emphasize protection of older forests and management and enhancement of values such as dispersed nonmotorized recreation opportunities and scenic resources.
• Produce a moderate sustained yield of timber. • Provide biological diversity using a system that maintains some old growth and mature forest, focusing on protection of areas where special status plant and animal species cluster. • Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern through emphasis on biological diversity and to the extent consistent with moderate timber production. • Retain existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities. • Manage scenic resources in selected high use areas, particularly emphasizing protection in corridors of existing and proposed wild and scenic rivers and major trails. • Provide substantial protection for anadromous fish habitat, other substantial streams and other water environments. • Provide for a wide range of recreation opportunities emphasizing dispersed use, while reducing conflicts among recreational user groups. • Find eligible river segments suitable for designation as scenic or recreational, if they are important and manageable, but not suitable for designation as scenic if designation would cause adverse economic impact. • Make land tenure adjustments to benefit a variety of uses and values. • Adopt appropriate special forest management practices in rural interface areas zoned for moderate or high density residential occupancy.	• Produce a sustained yield of timber consistent with allocations for other uses and values. • Protect habitat of the spotted owl in accordance with the Owl Conservation Strategy. • Protect habitat of all threatened and endangered species, species with high potential for listing, and species of related concern. • Retain all existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities. • Manage all identified scenic resources. • Provide substantial protection for wetlands and riparian areas along most streams and other water. • Emphasize dispersed nonmotorized recreation opportunities. • Find eligible river segments suitable for designation as wild, scenic or recreational, if they are important and manageable. • Make land tenure adjustments which would emphasize enhancement of nontimber uses and values. • Adopt special timber harvest and forest management practices in rural interface areas zoned for moderate or high density residential occupancy.	• Produce a sustained yield of timber consistent with allocations for other uses and values. • Protect all old growth and older mature forests. • Protect habitat of all threatened and endangered species, species with high potential for listing and species of related concern. • Retain all existing RNAs and ACECs and designate all eligible areas. • Manage all identified scenic resources and provide some visual resource protection for all lands. • Manage all riparian areas and wetlands to maintain and improve water quality and fisheries habitat, and contribute to wildlife habitat diversity. • Emphasize dispersed nonmotorized outdoor recreation opportunities. • Find all eligible river segments suitable for designation as wild, scenic or recreational rivers. • Make land tenure adjustments which would emphasize enhancement of nontimber uses and values. • Adopt special timber harvest and forest management practices extensively buffering rural interface areas zoned for moderate or high density residential occupancy and other rural interface areas as appropriate.

	All Common Alternatives	Alternative A
Issue No. 1: Timber Production Practices: Which forest lands should be available for timber management, and what practices should be used on those lands?	Guidance for All Common Alternatives: Lands allocated to intensive forest management under any of these alternatives would normally provide the highest nondeclining harvest level (even flow) of timber when the following conditions prevail: • Effective silvicultural techniques (such as clear cutting, shelterwood or partial cutting) appropriate to the land allocations are used. • All feasible site preparation and intensive management practices are applied. • Anticipated merchantability is the only constraint on minimum average stand diameter slated for future harvest. (In some areas this may result in harvest of timber stands as young as 40 years for several decades during the early to middle part of the next century under some alternatives.) • Adequate budgets are available to support the resultant timber sale program and allied intensive management practices, as well as scheduled monitoring linked to those activities. The common alternatives assume these practices and conditions on the lands allocated to intensive timber management, but incorporate less intensive management practices on other available forest lands to the extent needed to be consistent with the allocation of those lands. Where consistent with the goals and objectives of each alternative, the following silvicultural and harvest practices would be implemented on lands allocated primarily to timber management, to meet multiple land use objectives: Minimize regeneration delay by reforesting harvested sites as soon as practical. Calculate an empirical regeneration period based on representative stocking survey results, expected timber sale contract lengths and management objectives. Reforest harvested lands with indigenous commercial tree species. Emphasis would be placed on utilization of genetically improved stock in accordance with the Western Oregon Tree Improvement plan. Manage tree seed orchards to produce adequate supplies of genetically improved seed. Use available site preparation and seedling protection practices, including herbicides, using an integrated vegetation management approach. Emphasize those techniques that have proved most effective in assuring seedling survival and growth. (Actual practices will be based on site-specific analysis following completion of the RMP.) Convert to conifers those lands classified as commercial forest lands presently occupied by grass, hardwoods and brush.	Allocate all forest lands for timber production consistent with the management direction for other resources (Issue Nos. 2 and 3, etc.) in this alternative, except the following: Nonsuitable Woodland (See Figure 1-E-1 for Chart showing TPCC categories.)

Alternative B	Alternative C	Alternative D	Alternative E
Allocate all forest lands for timber production consistent with the management direction for other resources in this alternative, except the following: Nonsuitable Woodland Suitable Woodland - Low Site	Allocate all forest lands for timber production consistent with the management direction for other resources, except the following: Nonsuitable Woodland Suitable Woodland - Low Site Suitable Woodland - Nonsuitable Commercial Forest Land	Allocate all forest lands for timber production consistent with the management direction for other resources, except the following: Nonsuitable Woodland Suitable Woodland - All Categories	Allocate all forest lands for timber production consistent with the management direction for other resources, except the following: Nonsuitable Woodland Suitable Woodland - All Categories The Fragile Gradient-Restricted component of the Fragile Suitable TPCC category Site Class V

	All Common Alternatives	Alternative A
Issue No. 1 (Continued)	Plan hardwood sites for management of a sustained yield of hardwoods, where consistent with allocations for other uses or values. Implement commercial thinning of present and future stands where practicable and where research indicates increased gains in timber production are likely. Practice initial spacing control of seedlings/saplings through planting or thinning in conjunction with the control of competing vegetation, to maximize wood production by concentrating site resources in individual tree growth. Plan nitrogen fertilization applications for all present and future stands where research indicates increased wood yields would result. Plant specific root disease centers with resistant tree species. Consider uneven-age management in stands where this method would be economically feasible and would maintain environmental values. Consider efficiency of field operations and assurance of prompt reforestation in selecting the size of timber harvest units. Apply proper soil management measures to maintain soil productivity.	
Issue Nos. 2 and 3: Old-Growth Forests and Habitat Diversity To what extent and where should old-growth and/or mature forest habitats be retained, maintained or reestablished to meet various resource objectives? To what extent and where should BLM manage habitat to support populations of native wildlife species?	Any wildlife habitat management practice (such as nest boxes, road closures and forage seeding) not listed in the following could be implemented under any of the alternatives, as long as it is compatible with other management objectives. All special habitat features would be managed to protect their values. Mature and old-growth forests would be retained where Congressional designation of areas requires it. Snags and/or wildlife trees (to be converted to snags) would be retained where they occur on lands not allocated to timber harvest, except where public safety is a concern, and if left standing as nonmerchantable material on available forest lands. Where it would contribute to meeting wildlife tree objectives, create snags in areas not allocated primarily to timber production. A habitat goal of timber sale contracts would be to leave all snags and nonmerchantable trees that can be left consistent with safety considerations.	Mature and old-growth forests would be retained on most lands excluded from planned timber harvest by inclusion in the following allocations and TPCC categories: Nonsuitable Woodland Riparian Management Areas Existing high-use recreation sites T&E species recovery areas where timber harvest is prohibited Wilderness Areas

Alternative B

Contribute to habitat diversity using a system that protects mature and old-growth forest in large and small blocks. Mature and old-growth components of the forest would be distributed in a corridor system by seed zone and elevation. In the corridor system large blocks of approximately 640 acres would be connected by a series of small, stepping stone blocks of approximately 80 acres, spaced at about one-mile intervals. Blocks would be limited to defined corridor areas.

Public Domain lands and the following allocations and TPCC categories on O&C and CBWR would receive priority for placement into the system, to the extent that they fit; for instance, if they provide needed habitat and are suitably located to contribute to the system.

Nonsuitable Woodland
Suitable Woodland - Low Site
Riparian Management Areas
Recreation Sites
T&E species recovery areas where timber harvest is prohibited
Special Areas (Natural Areas, ACECs)
Wilderness Areas

Alternative C

This alternative would provide for retention and improvement of biological diversity. Blocks of forest land at least 600 acres in size and, where relevant opportunities exist, at least 2500 acres in size (including cornering tracts) would be identified as old-growth restoration and retention areas, totalling 15 to 20 percent of BLM-adminstered forest land. Identification of these areas would focus on protection of older forest stands, connectivity between larger reserves and subregions, and protection of identified areas where special status plant and animal species cluster.

The remaining BLM-administered forest lands, not excluded from timber harvest to address other issues, would be subject to intermediate harvests for density management where feasible, to maintain open canopy conditions and promote retention of mixed species, as well as accelerate development of old-growth structure conditions and prepare the stands for regeneration harvest

Alternative D

This alternative would manage habitats on BLM-administered lands to provide for a number and distribution of spotted owls that ensures continued existence of a well distributed population on those lands, so they may interact with spotted owls throughout the geographic range of the species, as recommended by the Conservation Strategy for the Northern Spotted Owl.

Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM-administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitat features would be appropriately buffered.

Alternative E

This alternative would preserve the following:

- all existing forest stands over 150 years old.
- additional lands within 400 feet of the above stands, to assist in maintaining natural ecological elements, protect the older stands from edge effect and natural disaster, and interconnect them into a sustainable network.
- all suitable habitat forest stands which most closely match the lands within two miles of each spotted owl site occupied by a single or pair of owls in the last six years (1985-1990). In addition protect younger forest where needed to provide contiguous habitat within a mile of those sites.
- in each section where BLM administers at least half of the land, a 40-acre block of the oldest stands remaining, concentrated around headwaters streams, to provide habitat for amphibians and nesting for pileated woodpeckers.

	All Common Alternatives	Alternative A
Issue Nos. 2 and 3 (Continued)		
Issue No. 4: Threatened and Endangered (and Other Special Status) Species Habitat What should BLM do to manage Federally listed threatened or endangered plants and animals and to prevent future Federal listing of plants and animals as threatened or endangered species?	Protect, monitor and manage habitats of Federal listed and proposed species in accordance with the Endangered Species Act and recovery plans, as legally required for self-sustaining survival.	Timber production constraints would be assumed in the formulation of the alternative only if critical habitat has been designated or there is a recovery or conservation plan within a month after completion of the Analysis of the Management Situation. Manage for the conservation of, and mitigate actions to protect habitats of, Federal Candidate, State Listed and Bureau Sensitive species where such actions would not diminish commercial use such as timber production.
Issue No. 5: Special Areas What areas on BLM-administered lands need special management to prevent irreparable damage to important historic, cultural or scenic values; to protect botanical or fish and wildlife resources or other natural systems or processes; and to protect life and safety from natural hazards? Which of these areas should be formally designated as Areas of Critical Environmental Concern (ACEC)?	Any areas considered appropriate for Research Natural Area (RNA) designation would also be considered appropriate for ACEC designation.	Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities (e.g., Wild River designation, the Endangered Species Act). Existing ACECs and potential ACECs that meet the preceding standard, including RNAs and proposed RNAs, would be retained or designated on nonforest lands or nonsuitable woodlands of no substantial mineral potential. Other existing ACECs and RNAs would be revoked.

Alternative B	Alternative C	Alternative D	Alternative E
Suitable wildlife trees and/or snags would be retained to maintain, where possible, cavity-dweller populations at 40 percent of the optimum woodpecker population levels in new timber harvest units. Wildlife tree management practices would be used on the available forest lands, including retention only of green culls and snags.	in the future. Regeneration harvests on these lands would be either heavy partial cuts (green-tree retention) or group selection cuts, and would not occur until after a stand had established old-growth characteristics. The lands in old-growth restoration and retention areas, which have not attained old-growth characteristics, would be subject to similar density management, where feasible, until they attain such a condition. Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitat features would be appropriately buffered.		In addition to retention of wildlife trees on lands not allocated to timber management, suitable wildlife trees would be retained to contribute to the maintenance of cavity-nester populations at 60 percent of the maximum potential population level on lands allocated to timber management. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitats would be appropriately buffered.
Same as Alternative A, except protect habitats of Federal Candidate, State Listed and Bureau Sensitive Species to the full extent on public domain land, and protect habitats of Federal Candidate (i.e., Category 1 and 2) species known only to occur on BLM-administered lands to the extent considered necessary to prevent their federal listing.	Same as Alternative B except for additional protection of special status species provided by criteria for Issues 2 and 3.	Manage all BLM-administered lands to support the conservation and protection of all Federal Candidate, State Listed, and Bureau Sensitive species and their habitats.	Same as Alternative D.
Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities. Do not allocate new RNAs on available O&C or CBWR land if a similar feature can be protected on a National Forest. Designate all potential ACECs (including RNAs) on Public Domain lands, nonforest lands, nonsuitable woodlands, and other lands allocated to nontimber uses.	Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities.	Retain all existing and designate all potential ACECs.	Same as Alternative D.

	All Common Alternatives	Alternative A
Issue No. 6: Visual Resources Which, if any, areas of BLM lands should be managed to reduce visual impacts or enhance visual (scenic) quality?	Note: Guidance for Issue 11 (Rural Interface Area Management) also addresses and defines visual resource management for Alternatives B, C, D and E in rural interface areas, except where this Issue 6 guidance sets a higher standard of visual resource management. Guidance for Issue 9A (Wild and Scenic Rivers) establishes criteria that will substantially dictate visual resource management by alternative in proposed wild and scenic river corridors. See Issue 9A and Issue 11 guidance for details.	Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage all other available (for timber harvest) forest land under VRM Class IV management objectives. Manage other lands as inventoried.
Issue Nos. 7 and 8: Stream/Riparian/Water Quality Where and how should riparian zones be managed to protect and improve water quality, fisheries and wildlife habitat? What actions should be undertaken to comply with state water quality standards? What should BLM do to manage for special needs such as municipal and domestic use?	Guidance for All Common Alternatives: Establish Riparian Management Areas (RMAs) on perennial streams (generally, 3rd order and larger streams), lakes, ponds and other waters, to meet Oregon Forest Practices Act requirements and Oregon water quality standards. Typical average widths of RMAs by alternative are displayed in Table 1. Within those RMAs no lands would be considered "available" (to offer timber for sale as part of the allowable sale quantity). Some timber harvest may occur, however, to achieve resource management objectives. These activities may include road construction and yarding corridors across streams and riparian zones to facilitate timber harvest outside the RMA. Logging, road building and site preparation methods would be designed to minimize the number and/or size of mass soil movements and to maintain the integrity of the RMAs. Other activities such as mining, recreation and ORV use would be regulated to protect water quality. Stream and riparian habitat improvement measures may be taken on any streams to improve water quality, fish habitat and/or wildlife habitat. Activities would be designed to meet Oregon Forest Practices Act (OFPA) requirements and Oregon water quality standards. Protect wetlands in accordance with Executive Order 11988 and 11990. Comply with written agreements with public water systems serving municipalities.	
Issue No. 9: Recreation Resources What areas or sites should be designed and/or managed to protect or enhance a variety of recreational opportunities?	Manage for dispersed recreation activities consistent with managed forest settings, including hunting, fishing, sightseeing, riding/ hiking, and rafting. Maintain and manage existing recreation facilities which make available significant dispersed recreation opportunities, including recreation sites, boat ramps, trails, interpretive signs and related improvements. Manage existing Special Recreation Management Areas (SRMAs) and delineate Extensive Recreation Management Areas (ERMAs).	Manage existing high-use recreation sites and trails and expand them where needed. Close low use recreation sites and trails. Designate lands open to off-road vehicles (ORV) and leave roads open to motorized use, except where such designation would conflict with other allocations.

Alternative B	Alternative C	Alternative D	Alternative E
Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage as inventoried all available forest land adjacent to (within a quarter mile) developed recreation sites, state and federal highways, state scenic waterways, and rivers designated under the federal Wild and Scenic Rivers Act. Manage all other available forest land under VRM Class IV management objectives. Manage other lands as inventoried.	Same as Alternative B, except on available forest land where BLM-administered land makes up more than half of a viewshed, manage lands as inventoried.	Manage all lands as inventoried.	Same as Alternative D, except manage as VRM Class III all BLM-administered lands inventoried as Class IV; and manage as VRM Class I BLM-administered lands adjacent to (within a quarter mile) developed recreation sites, state and federal highways, state scenic waterways and rivers designated under the federal Wild and Scenic Rivers act.

Table 3-1. Riparian Management Areas

	Average RMA Width* (each side of the stream in feet)				
Stream Order	ALT. A	ALT. B	ALT. C	ALT. D	ALT. E
1					50
2				60	60
3	75	75	105	140	200
4	75	100	150	200	200
5	75	140	210	280	280
6	75	160	240	320	320
Lakes, Ponds & Other Waters	75	100	150	200	400

* Actual RMA widths would be determined by on-the-ground riparian vegetation, terrain and stream characteristics, but would be a minimum of 50 feet on all 3rd order and larger streams. First and second order streams would have RMAs designated if perennial or if the beneficial uses warrant.

Alternative B	Alternative C	Alternative D	Alternative E
Same as Alternative A, except support the State's Regional Economic Development Plan for the geographic area, retain options for new SRMAs and high value potential recreation sites and trails on Public Domain lands, maintain and/or improve all existing developed recreation sites, and consider reopening sites closed in recent years.	Allocate and manage new SRMAs. Continue management of all existing recreation sites and trails, and consider reopening sites closed in recent years. Emphasize wildlife viewing, interpretation and related old-growth forest recreation opportunities, both to attract nonlocal visitors and to serve local users. Retain options for future development of high value potential sites, trails and sightseeing opportunities. Impose additional ORV limitations or road closures to protect wildlife habitat or old-growth forest recreation opportunities, minimize conflicts with hikers and horseback riders, or meet other resource objectives.	Same as Alternative C, except manage for an optimum range of nonmotorized recreation. Retain options for future development of recreation sites and facilities for dispersed recreation opportunities. Retain existing pockets of old-growth forest that are both adjacent to and accessible from existing or potential recreation areas. Prohibit ORV and road use as appropriate to improve wildlife habitat or protect the ecosystem.	Same as Alternative D.

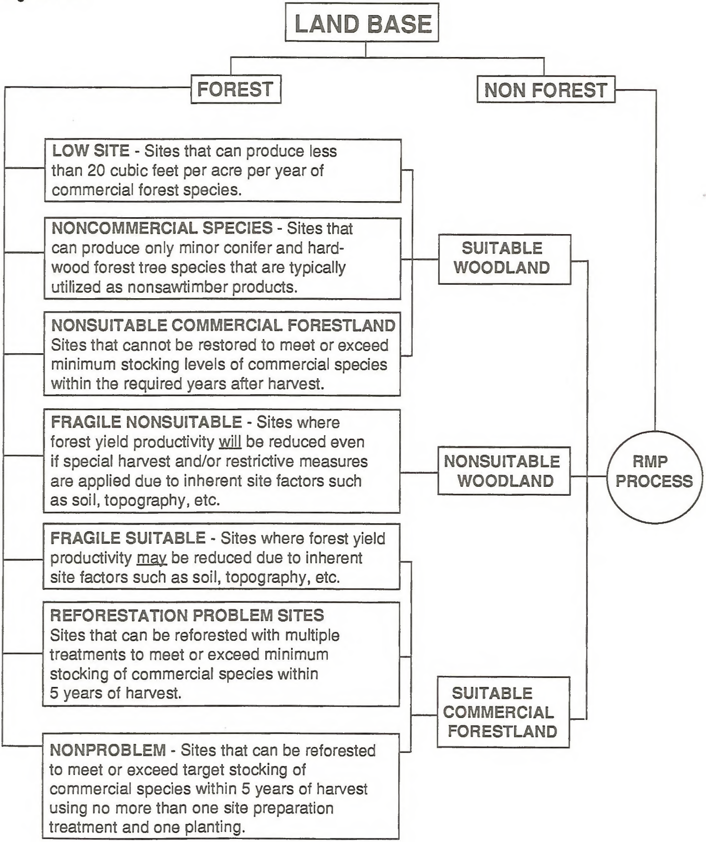
	All Common Alternatives	Alternative A
Issue No. 9A: Wild and Scenic Rivers What, if any, rivers should be found suitable for designation?	Provide interim protection for all river segments determined to be suitable, until Congressional action on BLM plan recommendations. Interim protection should be appropriate to the highest category for which the river is determined to be suitable. Manage Congressionally designated rivers consistent with their designation.	No rivers found suitable for designation under any classification.
Issue No. 10: Land Tenure In what areas would BLM-administered lands be sold, exchanged or transferred out of federal ownership under other authorities to improve management efficiency and benefit resource program objectives? In what areas would BLM attempt to acquire lands to improve management efficiency and benefit resource program objectives?	A major lands program effort would use exchanges to consolidate land ownership patterns to benefit one or more of the resources managed, such as timber, watershed, wildlife habitat, recreation, cultural, botanical, and minerals. Land tenure adjustment would be guided by a three-zone concept utilizing the following standards: Zone 1 includes areas currently identified as having high public resource values, and other efficiently managed lands. The natural resource values may require protection by federal law, Executive Order or policy. These lands may have other values or natural systems which merit long term public ownership. They do not meet the criteria for sale under FLPMA Section 203(a) and would generally be retained in public ownership. The Zone 1 boundaries should be relatively close to or on BLM property lines except where the intent is to show preferred acquisition areas. Zone 2 includes lands that are suitable for exchange because they form discontinuous ownership patterns, are less efficient to manage than Zone 1 lands, and may not be accessible to the general public. Where appropriate opportunities are identified, these BLM-administered lands may be exchanged for other lands in Zones 1 or 2, transferred to other public agencies, or given some form of cooperative management. These lands would not be expected to meet the criteria for sale under Section 203(a), and would not be identified as suitable for such sale. Zone 3 includes lands that are scattered and isolated with no known unique natural resource values. Zone 3 lands are available for use in exchanges for private inholdings in Zone 1 (high priority) or Zone 2 (moderate priority). They are also potentially suitable for disposal through sale	Exchanges would be made to acquire lands which would enhance the nondeclining harvest level of the commercial forest land managed by BLM, by improving age class distribution or other harvest level determination factors. Factors to consider include site quality, access to public forest land, logical logging units, and management of public forest land to facilitate timber harvest. No exchanges would be made to acquire lands more valuable for nontimber uses. No commercial timberland would be sold or leased. Leases or conveyance of land in Zones 2 and 3 other than commercial timberland would be made under the Recreation and Public Purposes Act to provide appropriate facilities or services.

Alternative B	Alternative C	Alternative D	Alternative E
No rivers found suitable for designation as wild or scenic. River segments eligible for wild, scenic or recreational classification found suitable for designation as recreational, if all of the following circumstances exist: - no net adverse economic impacts on the local economy. - river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be the top river in the State Comprehensive Outdoor Recreation Plan (SCORP) region. - BLM can effectively manage the outstanding values of the river segment.	River segments eligible for scenic or recreational river status found suitable for designation consistent with their highest potential classification, and river segments eligible for wild classification found suitable for designation as scenic, if all of the following circumstances exist. If only the economic impact test is not met, find suitable for designation as recreational. - no net adverse impacts on the local economy. - river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top two rivers in the SCORP region. - BLM can effectively manage the outstanding values of the river segment.	Eligible river segments found suitable for designation consistent with their highest potential classification if the following circumstances exist. - river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top four rivers in the SCORP region. - BLM can effectively manage the outstanding values of the river segment.	All eligible river segments found suitable for designation consistent with their highest potential classification.
Exchanges of O&C and CBWR lands would be made primarily to acquire lands which would enhance timber management opportunities. Exchanges of public domain lands would be made to benefit one or more of the resources managed, including nontimber values. Sale of O&C and CBWR lands other than available commercial forest lands, and of public domain lands, would be made to dispose of lands that meet any of the criteria of FLPMA Section 203(a). Leases on such lands would be made to accommodate other uses. Leases or conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide appropriate facilities or services.	Same as Alternative B, except emphasis would also be given to exchanges of O&C and CBWR lands that would contribute to conservation of biological diversity.	Land exchanges would be made to benefit one or more of the resources managed. Exchanges involving disposal of timber to acquire lands containing greater nontimber values would be emphasized. Sales of lands other than available commercial forest lands would be made to dispose of lands that meet criteria (1) or (2) of FLPMA Section 203(a), but sales of land that meet only criterion (3) would not be made. No lands would be leased, except leases and conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide facilities or services for the benefit of the public.	Same as Alternative D.

	All Common Alternatives	Alternative A
Issue No 10. (Continued).	under FLPMA Section 203(a) if important recreation, wildlife, watershed, threatened or endangered species habitat, and/or cultural values are not identified during disposal clearance reviews and no viable exchange proposals for them can be identified. The discussion of Zone 3 lands must state which of the disposal criteria in FLPMA, Section 203(a), apply. Zone 3 lands would also be available for transfer to another agency or to local governments, as needed to accommodate community expansion and other public purposes.	
Issue No. 11: Rural Interface Area Management Which BLM-administered lands should be allocated to receive special management practices due to the concerns of residents who live in close proximity? (Rural interface areas are areas where BLM-administered lands are adjacent to or intermingled with privately owned lands where county zoning has created or allows for creation of lots as small as 1 to 20 acres. In most rural interface areas concerns of the residents are related to forest management practices, visual quality and potential affects on domestic water sources and water supplies.)		No special management actions except those that address other issues.

Alternative B	Alternative C	Alternative D	Alternative E
On BLM-administered lands within one quarter mile of private lands in identified rural interface areas zoned for 1 to 5-acre lots, customary forest management practices would be altered, where realistically feasible, to mitigate the adjacent neighbors' concerns (i.e., management would look for alternative methods of practicing intensive forest management). Examples of management options include harvest regimes other than clearcutting, hand application rather than aerial application of herbicides and pesticides, inclusion of additional buffers for domestic water sources, and hand piling slash for burning as opposed to broadcast burning. All BLM-administered lands within a quarter mile of designated rural interface areas 1 to 5-acre lots) would be managed for VRM class III objectives.	Same as Alternative B except that lands zoned for 1 to 20-acre lots would also be included as the rural interface area.	On BLM-administered lands within one quarter mile of private lands in rural interface areas zoned for 1 to 20-acre lots, there would be no herbicide spraying, no clear cutting, and no prescribed burning. BLM-administered lands within this area would be managed for VRM class II objectives.	Same as Alternative D except BLM-administered lands within one half mile of private lands in rural interface areas would be managed as discussed in Alternative D. Areas zoned for lots larger than 20 acres, but with tax lots of 20 acres or less and/or existing legal multiple residences, may also be addressed in this alternative.

Figure 1-E-1


LAND BASE
FOREST
NON FOREST
LOW SITE - Sites that can produce less than 20 cubic feet per acre per year of commercial forest species.
NONCOMMERCIAL SPECIES - Sites that can produce only minor conifer and hard-wood forest tree species that are typically utilized as nonsawtimber products.
NONSUITABLE COMMERCIAL FORESTLAND Sites that cannot be restored to meet or exceed minimum stocking levels of commercial species within the required years after harvest.
FRAGILE NONSUITABLE - Sites where forest yield productivity will be reduced even if special harvest and/or restrictive measures are applied due to inherent site factors such as soil, topography, etc.
FRAGILE SUITABLE - Sites where forest yield productivity may be reduced due to inherent site factors such as soil, topography, etc.
REFORESTATION PROBLEM SITES Sites that can be reforested with multiple treatments to meet or exceed minimum stocking of commercial species within 5 years of harvest.
NONPROBLEM - Sites that can be reforested to meet or exceed target stocking of commercial species within 5 years of harvest using no more than one site preparation treatment and one planting.
SUITABLE WOODLAND
NONSUITABLE WOODLAND
SUITABLE COMMERCIAL FORESTLAND
RMP PROCESS

Sensitivity Analyses

Sensitivity analysis is a process of examining specific opportunity costs and trade-offs which would result from making changes in single sensitive elements of an alternative. Such analyses are helpful in developing the preferred alternative, to make it most effective in reconciling potential conflicts and optimizing overall benefits. The sensitivity analysis will have the further benefit of informing the public about certain trade-offs, which should facilitate their offering informed preferences in their comments on the Draft RMP/EIS.

Because of the number of issues, concerns and alternatives, sensitivity analysis must be tightly focused to be manageable. The analysis, therefore, will focus on mid-range common alternatives and the preferred alternative.

At a minimum, the following will be analyzed for effects on timber harvest (ASQ) and related jobs and county revenues, and on other relevant resources or values:

1. For alternatives B, C and D, effects of substituting the next higher and next lower common alternative levels of riparian zone protection, and of providing only legally required (Alternative A) protection of riparian zones to preserve commercial trees on suitable forest or woodland. For the preferred alternative, the effects of substituting the alternative A and E levels.

2. For Alternative B, the effects of allocating no lands specifically for maintenance of older forest stands; or of managing the lands allocated for such protection on 250-year or longer rotation, with explicit provision for replacement; or of managing the lands allocated for timber production on 150-year rotation.

3. For Alternatives B and C, the effects of managing all lands allocated for timber production entirely under either of alternative C's partial retention approaches.

4. For Alternative C, the effects of managing the lands allocated for timber production entirely for 15 to 20 percent partial retention, but in the first decades not harvesting in the oldest 20 percent of them.

5. For Alternatives B and D, the effects of substituting the USF&WS proposed spotted owl recovery plan for each alternative's older forest or spotted owl protection approach. For the preferred alternative, to provide a similar analysis, the effects of substituting the 50-11-40 rule for provision of connectivity by special management in Connectivity Areas.

6. For Alternative C, the effects of allocating the restoration and retention blocks to 35+ percent partial retention management, or of accelerating density management in those blocks in the first decade to the extent practical.

7. For Alternative D, the effects of a minimum harvest age constraint of 60 years (vis-a-vis 40 years in D in many plans).

8. For the preferred alternative:

   - The effects of precluding all timber harvest in old growth ecosystem areas.

   - No regeneration harvest of stands younger than cumulation of mean annual increment.

   - No constraint on minimum age of stands subject to regeneration harvest in General Forest Management Areas.

   - Foregoing planting genetically selected stock, vegetation management for release and precommericial thinning, fertilization, and stand conversion. To be analyzed for each practice individually and for all combined.

Other sensitivity analysis elements or increments may be added as deemed appropriate by a district.

Estimated effects on ASQ, together with resulting local employment and county revenues for each analysis, will be quantified. Effects on other resource attributes will be quantified only where available analytical techniques are readily applicable. Otherwise, effects will be compared to relevant environmental consequence conclusions for the basic plan alternatives.

Chapter 2
Appendices

Appendix 2-A Harvest Scheduling Model and Allowable Sale Quantity Calculation

Selection of Model

Early in the planning effort, the BLM began exploring options for available timber harvest scheduling models. They used computerized harvest scheduling programs designed to model timber land inventories and project harvest schedules into the future under different management regimes.

By early 1987, the BLM had tentatively selected the Trim-Plus model for use in the 1990s planning process. Public workshops were scheduled at several BLM western Oregon offices to discuss the choice of harvest model. The BLM selected the Trim-Plus model after considering the comments received and testing the model on data from the current plan.

Trim-Plus is a binary search model. It identifies the highest sustainable harvest level through a series of trial runs, each one raising or lowering the previous harvest level by a specified search increment. Trim-Plus is similar in this respect to the SIMMIX model, which was used by the BLM to generate harvest levels for the 1980s planning process.

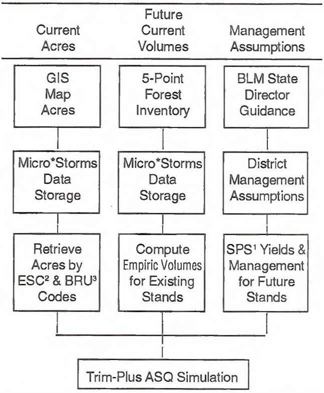
Some of the features of Trim-Plus that led to its selection were:

- The capability to make separate nondeclining harvest level calculations or simulations on multiple minimum harvest ages.
- Ability to handle a variety of land use classes simultaneously.
- Usable at the district level on desk top microcomputers.
- Generates excellent reports and graphics displays.
- Incorporates relatively simple, easy-to-use input and output files.
- Provides many simulations at relatively low cost.
- Readily performs alternate harvest simulations, to test the impact on harvest levels of varying land use allocations or management prescriptions.

ASQ Calculation Process

The Trim-Plus model was used to determine ASQ levels for every alternative except alternative D. To perform an ASQ simulation, Trim-Plus requires three basic types of information: (1) acres of forest land, (2) timber volumes on those acres, and (3) the yield assumptions to be implemented. The following flow chart outlines the principal components of the calculation process, and shows the sequence of operations involved in each ASQ run.

ASQ Flow Chart



[1] SPS = Stand Projection System
[2] ESC = Existing Stand Condition
[3] BRU = Basic Resource Unit

The basic elements of the flow chart are described in the following sections.

Current Acres

Acres for each Trim-Plus run are derived from digitized map overlays, part of the BLM's Geographic Information System (GIS). There is a separate digital map for each topic or theme pertinent to the plan. These maps can be overlaid or merged to allow analysis and generation of acres for any combination of themes under a variety of situations.

Micro*Storms Data Base

The basic storage location for acres and related timber stand information is a large relational data base called Micro*Storms. Data is separated into three primary

files: the SITE file which contains acreage, site description, timber type, past treatments and codes for Existing Stand Condition (ESC); a Micro*Storms identifier which groups stands by past treatment category and treatment recommendation; the TPCC file which contains timber productivity classification information; and the Continuous Forest Inventory (CFI) file which contains data from the district's permanent timber inventory plots. Information from these files is linked to digitized maps.

Basic Resource Units

Within the Trim-Plus model, the available forest land base is segregated into large groups sharing the same sustained yield unit, resource area, site class group, kind of management, and timber type. These groups are called Basic Resource Units (BRUs). The ASQ and other output data from Trim-Plus is reported by BRU and for groups of BRUs, plus the entire sustained yield unit.

Current Volumes

The current timber volume on BLM forest lands is derived from analysis of data from more than 700 permanent (5-point) inventory plots distributed throughout the district. These plots are remeasured approximately every ten years. The last measurement was in 1987-1988. Each plot is a cluster of five sample points, and each point is the center of a fixed plot and a variable-radius (prism) plot. The plot data provides information pertaining to stand volume, stand age, tree species, tree sizes, defect, and growth rates. Information from the plots is stored in the Micro*Storms CFI file.

Empiric Yields

To represent the volume of existing stands in the Trim-Plus model, the actual inventory plot volumes for each age class have been used to develop empiric yield curves for each sustained yield unit. For each inventory group, stand volumes from the empiric yield curve were used for age classes that had fewer than three plots. The averages of the actual plot volumes were used for age classes that had three or more measured plots, and for all stands over 200 years old.

Future Management Assumptions

The yields of future stands depend on the kinds of management assumptions built into each alternative of the plan. These assumptions include the minimum harvest age, regeneration lag, future stocking levels, anticipated gains from planting of genetically improved seedlings, application of density control treatments such as precommercial and commercial thinning, forest fertilization, the stand ages when these treatments are applied, and the portion of each stand to be retained for wildlife habitat needs or diversity of the future stand. Broad guidelines regarding the range of management practices appropriate to each of the common alternatives of the RMP have been provided by the office of the BLM State Director. These guidelines are referred to as State Director Guidance. Prescriptions for stand management under each alternative have been further refined at the district level. Details of this process are available at the district office.

Stand Projection System

The yields for existing stands less than age 30 and for all future stands are estimated using the Stand Projection System (SPS). SPS is a computer program designed to simulate the growth and development of forest stands. The program operates with a set of equations developed from data from a large number of forest research plots located throughout western Oregon and Washington. Yield outputs are provided in net cubic feet and in net board feet, Scribner.

The following criteria were used to guide the application of intensive silvicultural practices in the SPS model:

- Density control in young stands: Under all alternatives, stands received precommercial thinning if overstocked. In most cases, stands were thinned to 300 trees per acre if later commercial thinning was planned, and to 220 trees per acre where no further thinning was planned.

- Commercial thinning/density control: Under all alternatives, thinning was limited to the percentage of each sustained yield unit on which slope, topography, and road locations were suitable for partial cutting using either tractors or cable systems. Thinning prescriptions vary between alternatives and between different management zones under the PA. See chapter 2 for details.

- Forest fertilization: Intensively managed stands under alternatives NA, A, B, D, and E were fertilized three times at 15- to 20-year intervals. Stands within the general forest management area under the PA were also fertilized. Each treatment consisted of 200 pounds of Nitrogen per acre. The first application was made at time of PCT, and the last occurred at least ten years before final harvest. The second and third applications were made following commercial thinnings, in most cases. The SPS fertilization gains are based on recent studies by the Pacific Northwest Research Station, U.S. Forest Service.

- Genetic selection: Under alternatives NA, A, B, D, E, and the general forest management area of the PA, genetically selected tree seedlings would be planted when they are available. Genetically selected stock would comprise no more than half of the seedlings planted under alternative C. Genetic gain was reflected in SPS by adjusting the site index so that stand heights at age 15 were increased by approximately the same percentage as the observed height gains in test plantations. Details of this procedure are also available at the district office.

Adjustments to SPS yield outputs

SPS is built upon data from plots which have full stocking, no openings, and no significant damage. Therefore, SPS simulations provide estimations of maximum biological output. Actual forests are less uniform and subject to variable amounts of damage and loss. Because of this, the simulator must be adjusted for field conditions. Adjustments have been made in the following ways:

- Stand tables: Tree lists from existing stands have been used as a starting point for many of the SPS simulations.

- Defect and breakage: A variable percentage adjustment, depending on stand age, has been applied to SPS outputs to reflect volume loss at harvest due to defect and breakage.

- Clumpiness factor: A discount factor has been estimated for nonstocked openings and understocked areas in stands. For each sustained yield unit (SYU), this discount was determined by analyzing stocking on the 10 and 20-year-old plots of the 5-PT inventory. These results were used to derive the clumpiness factor in the SPS model, which refers to the percentage of each area which is actually stocked. By SYU, the clumpiness factor ranged from 83 to 88 percent.

- Soil compaction: Salem's TPCC identifies tracts which have been subjected to detrimental soil compaction on more than 12 percent of the area. The compaction resulted from either tractor yarding or tractor clearing for site preparation. Projected yields on those acres have been reduced by 6 percent.

- Root rot: Survey data indicate that an average of 14 percent of Salem's commercial conifer acres are infected with root rots, particularly laminated root rot, Phellinus weirii. Areas with identified root rot infection would be planted with species resistant or immune to the disease following harvest. This would reduce the infected area in those locations. However, further spread of root disease would be expected in harvested areas in which existing root rot infection is not identified. Yields have been reduced by 50 percent on those acres to account for root rot losses.

- Green Tree Retention: Under alternatives C and the PA, some merchantable trees would be left standing within harvest units to provide other resource values. Under alternative C, the portion of the stand available for harvest was identified within the Trim-Plus model. Under the PA, yields from the SPS model were discounted directly to reflect retention of merchantable live trees. Details of this process are available at the district office.

ASQ determination for Alternative D

Alternative D was designed to incorporate the basic features of the Interagency Scientific Report, or Thomas Plan, regarding habitat needs for the northern spotted owl. Under the recommendations of this report, particular blocks of land called Habitat Conservation Areas (HCAs) would be excluded from any planned harvest. Timber harvest on all other areas would have spatial constraints, following what is known as the 50-11-40 rule. To comply with the rule, forest stands on BLM-administered lands within each quarter township (160 acres) would need to meet or exceed the 50-11-40 standard at any point in time. This means that at least 50 percent of those forest stands would need to have an average diameter of at least 11 inches breast high and have at least 40 percent crown closure.

The Trim-Plus model does not have the ability to operate with the 50-11-40 constraint. Consequently, the alternative D ASQ was determined with an alternate harvest scheduling model developed by the BLM. This 50-11-40 model was developed within the Micro*Storms data base, which contains the basic stand information needed to determine (1) the number of acres located outside HCAs; (2) the proportion of those acres with timber stands over 40 years of age (assumed to meet the 11-inch diameter requirement); and (3) the proportion of those acres in turn having stands with at least 40 percent crown closure. Only forest acres in excess of 50 percent of the acres determined above are considered available for harvest. A minimum 80-year rotation length is imposed by making no more than 1/8 (westside of district) and 1/11 (eastside of district) of the total acres within a township quarter available for harvest in any decade.

Allowable Cut Effect (ACE)

Existing forests on the Salem District are composed primarily of mature stands which became established following large fires in the last century, and young stands on lands harvested during the last 30-40 years. The older stands have passed the stage of most rapid growth. Many of the younger stands are not old enough to begin producing a significant volume of merchantable timber. Because of this, the average annual growth of the forest, in terms of merchantable cubic feet, is substantially below its potential. The forest could be regarded as being in transition from an unmanaged to a managed state.

In the classical sense, a regulated forest is achieved when it contains approximately equal acreage in each age class bracket. The average annual growth and harvest are then in balance, and the forest can produce its maximum sustainable annual yield of timber.

It would be extremely conservative to calculate an ASQ based solely on current annual growth for a forest still in a transition state. The resulting reduced cutting level would also lengthen the time required to develop a regulated forest.

The BLM uses an alternative approach, in which the current harvest level, or ASQ, is based on the existing timber inventory and predicted levels of future growth. This approach assumes that certain forest management practices such as genetic improvement, fertilization, and thinning would produce predictable increases in future yields. As excess harvest age timber in the present forest is gradually depleted, levels of growth and harvest eventually come into balance. This process of taking credit now for expected future growth increases has been termed the Allowable Cut Effect.

Appendix 2-B Timber Harvest Methods and Silvicultural Practices

Timber Harvest Methods

Silvicultural systems are commonly placed into one of two broad groups: even-aged systems, in which most trees in a stand are close to the same age, and uneven-aged, or selection systems, in which the trees span a range of age classes.

Clearcutting has been the most common harvest method used by the BLM in the planning area. It permits maximum timber production with minimum costs of sale preparation, logging, site preparation, and reforestation.

The shelterwood system has been used to a limited extent in the planning area. In some cases, a continuous visual canopy was considered important. Elsewhere, on dry, rocky, south or west-facing slopes, reforestation would be difficult on a completely exposed site.

In the seed tree system, a smaller number of trees are left, primarily to produce the seed needed to establish a new even-aged stand. Following seedling establishment, the seed trees (3-5 per acre) may or may not be harvested, depending on the management objectives for the area. The seed tree system was common 30-40 years ago, when natural seed production was generally the only means of reforestation. It has been used very little in the planning area in recent years.

In the single tree selection method, individual trees or small groups of trees are removed and new growth occurs in their place. Generally, only shade-tolerant species are able to regenerate and grow well under such small openings in the canopy. The resulting stand has a variety of tree ages.

In the group selection system, trees are harvested in small patches, usually no more than one to two acres in size. Such openings are large enough to permit regeneration and growth of shade-tolerant species, and, to a more limited extent, intolerant species such as Douglas-fir, which usually thrive best in full sunlight. Selection systems are used extensively in the drier pine and mixed conifer forests of southern, central, and eastern Oregon.

The silvicultural system appropriate for any particular area depends on the management objectives for that area and the topography and site conditions. For example, under the management objectives for alternatives A and B, a high priority is assigned to maximizing production of timber on available acres. To accomplish this, most harvesting under these alternatives would be done by clearcutting.

Under alternative C and the PA, some or all of the harvests would resemble a shelterwood. A portion of the stand would be reserved from cutting. The reserved trees could be distributed over the harvest area as individual trees and small clumps. Unlike a shelterwood, the residual trees would not be removed later. They would remain to provide a biological legacy of large green trees, future snags, and future sources of large woody debris on the forest floor. The resulting future stands would be two-storied or multistoried, with multiple canopy layers plus a mixture of species and size classes.

Regardless of the alternative selected, clearcutting would continue to be applied in certain situations. For example, clearcutting would be used in stands that have a high potential for windthrow, or where the majority of trees have already been blown down or broken off during a major windstorm. Clearcutting would also be needed in stands that are heavily infected with certain diseases.

Silvicultural Practices

Following timber harvest, treatment of the site is frequently necessary to reduce fire hazard, remove excess logging debris that obstructs tree planting efforts, and to reduce the extent of competing vegetation. During the past decade, such site preparation has been accomplished by broadcast burning, application of herbicides, or manual or mechanical ("other") treatments. The acreage of these treatments is summarized in table 3-35.

Some sites capable of commercial conifer production are presently occupied by brush or scattered hardwoods. When such vegetation is cleared and the site planted with conifer tree seedlings, the process is termed conversion. Acres of conversion during the past decade are shown in table 3-35.

Prompt planting of harvested areas is one of the most important keys to successful reforestation. The delay between the sale of timber and successful reforestation is termed the regeneration period. Within the planning area, the regeneration period during the past decade has averaged from 3 to 4 years, depending on location. When the seedlings planted represent parent tree families which have demonstrated faster growth rates in test plantations, such seedlings are termed genetic stock. All other seedlings are termed normal stock. Acres planted with genetic and normal stock during the past decade are shown in table 3-35.

In the planning area, timber harvest units are treated when necessary to control competing vegetation, prevent excessive animal damage, and limit the spread of root diseases.

Fast-growing competing vegetation often overtops and suppresses slower-starting conifer seedlings. The degree and type of vegetation competition varies from site to site. On dry sites, grasses, forbs, and shrubs compete strongly for water. On moister sites, many shrubs and hardwoods grow rapidly to overtop conifer seedlings and prevent much of the sunlight from reaching them. Even on sites which are moist during most of the year, there is usually a dry summer period in which competition for soil moisture is intense.

Treatments to reduce vegetation competition are termed plantation release. Acres of plantation release treatments are summarized in table 3-35.

BLM used herbicides as one means of controlling competing vegetation until 1983. At that time, a court injunction prevented further use, leaving manual cutting as the principal method of plantation release.

Animal damage can result in significant losses in forest plantations. In the first few years after planting, seedlings are susceptible to damage from mountain beaver, mice, gophers, deer, and elk. Even after 10 to 20 years, porcupine and bear cause bark damage and mortality of trees in localized areas. The acreage of treatments to protect trees from animal damage is summarized in table 3-35.

Several root diseases occur in the planning area and cause significant mortality losses if not controlled. When timber is harvested from identified root disease pockets, these areas are planted with seedlings of tree species resistant or immune to the disease to prevent infection of the new stand.

Precommercial thinning, commercial thinning, and fertilization are intensive management practices with direct impacts on the ASQ. Precommercial thinning is frequently applied to young stands aged 10 to 15 years to ensure that desired crop trees have sufficient room to grow. Commercial thinning, usually applied to stands aged 40 to 70 years, encourages continued fast growth of selected trees. Nitrogen fertilizer is applied to selected young stands to improve growth rates. The acreage of these practices in the planning area during the past decade is displayed in table 3-35.

Wood Quality

Wood quality refers to the physical characteristics of harvested logs. The most important quality factors are log size; wood density and strength; number, size, and type of knots; and proportion of juvenile wood.

Larger logs, other things being equal, command a higher price per cubic foot than smaller logs. This is because larger diameter trees are more economical to fall, yard, and transport, and can be sawn into a greater variety of higher value wood products. To produce larger logs, timber stands must be grown for longer periods of time or be grown at low densities to allow more rapid diameter growth.

Wood density is closely related to strength. In general, trees with narrower annual growth rings produce wood of higher density and strength, which can then be sawn into higher-value structural lumber. Narrow growth rings are usually found in trees grown in high-density stands.

Knots are produced when wood is formed around live or dead limbs. The larger the limbs, the larger the knots. Generally, product value is reduced as the number and size of knots in the wood increase. Trees grown in lower density stands are likely to have more and larger limbs, and therefore more and larger knots, than trees grown in higher density stands.

Juvenile wood refers to the wood that forms in the portion of a tree within the live crown. Compared to mature wood, which forms in the lower stem of the tree below the live crown, juvenile wood is typically of lower density and strength, and has a greater tendency to warp. Logs that contain high proportions of juvenile wood would usually have lower product values.

Within the planning area, wood quality is generally high in well-stock natural stands of mature or old-growth timber. In poorly stocked areas, however, wide spacing between trees generally results in many large limbs and lower wood quality.

Appendix 2-C
The Tree Improvement Program

The BLM's tree improvement program in Oregon has been designed primarily to increase the long-term production of wood fiber by identifying trees which possess genetic ability for faster growth and other desirable characteristics. This is accomplished by means of (1) selection of plus trees which are wild trees displaying superior growth; (2) collection of seed from those trees; (3) establishment of test plantations of seedlings grown from plus tree seed; (4) measurement of seedling growth in the test sites; and (5) establishment of seed production orchards containing trees from the families which performed best in the test sites (first generation seed orchards). A later phase would consist of controlled breeding between individuals from the best-performing families (second generation seed orchards). The most important species included in the tree improvement program are Douglas-fir, western hemlock, sugar pine, and noble fir.

That a particular tree in the wild is taller and larger than neighboring trees of the same age does not guarantee the tree is genetically programmed for faster growth. Many factors affect the performance of individual trees. These include initial spacing, damage by animals, weather, or disease, competition from other vegetation, and site variables such as soil depth, moisture storage capacity, and drainage. Because of this, repeated growth tests in the uniform environment of test sites are essential. This determines which tree families have a genetic component which accelerates growth compared to the average of other trees of the same species.

The tree improvement program also addresses characteristics other than growth. For example, the sugar pine improvement program has focused on identifying parent trees which possess resistance to the white pine blister rust. The BLM is working with the U.S. Forest Service to build a population of disease-resistant sugar pine. The BLM and other members of the Northwest Tree Improvement Cooperative are also developing programs to improve wood quality through selection and testing of parent trees which produce wood of higher density. Members of the Northwest Tree Improvement Cooperative include the U.S. Forest Service, Oregon State Department of Forestry, several counties, and some industrial forestry companies.

With the increasing emphasis on biological diversity in forest management, there is concern that tree improvement programs may reduce the natural diversity of forests. This could make the forest less resistant to damaging agents such as insects, disease, or climate fluctuations. Current tree improvement methods, however, address concerns for conserving and enhancing the genetic diversity of the improved species (Daniels 1990).

The expectation of increased growth or greater resistance to disease resulting from the tree improvement program is based on selection of the desired traits from the genetic variation naturally present in tree species. Through this program of selection and testing, the selected traits are increased in frequency in relation to the host of other traits present in the total population of the species.

The design of the cooperative tree improvement program conserves the genetic diversity of each improved species. This is done by a wide distribution of breeding units, selection of large numbers of parent trees for testing, and testing of a large number of seedlings from each family in the progeny test sites.

For purposes of tree improvement, forest lands in western Oregon and Washington have been subdivided into discrete breeding units. These units have been defined by differences in local climate, geography, and elevation. They appear to differ genetically from unit to unit. Breeding units range from 30,000 to 200,000 acres, depending on the perceived environmental variations present. There are 70 breeding units (all species) encompassing about six million acres of forest land. These breeding units are intended to conserve and maintain the genetic diversity among populations of each species included in the program.

Selection of a large number of parent trees within each breeding unit also helps to ensure conservation of genetic material. From 160 to 900 parent trees have been selected from each unit. These trees were selected for characteristics such as growth rate, form, and vigor. The selection of hundreds of parent trees per breeding unit provides a broad genetic base for breeding programs.

Parent trees selected for breeding and seed orchard use undergo a standardized field testing of their offspring. A series of progeny tests, comprising 6-12 test plantations, or test sites, are established within every breeding unit. The number and location of test sites are carefully selected to represent the range of environments within the breeding unit.

In western Oregon and western Washington, approximately 650 progeny test sites containing nearly three million seedlings have been established. Each site contains several thousand well-maintained and identi-

fied test trees. Each of these seedlings is the offspring of one of the selected parent trees and wind borne pollen from another (and unknown) tree in the adjoining stand. Seedling growth is measured at five-year intervals. This information is analyzed and stored for short and long-term use. These test sites comprise a large reservoir of genetic diversity from local gene pools of each selected tree species throughout the region.

Douglas-fir, the most widely planted species in the Pacific Northwest, exhibits high levels of genetic variability relative to other forest tree species. Studies of genetic diversity in coastal Douglas-fir have consistently shown that a great deal of variation exists in this species for genes controlling quantitative traits, such as height and diameter growth (Silen 1978). This variability is great within individual stands and between stands located across a wide range of geographic and environmental conditions.

The BLM's western Oregon tree improvement program contains 52 Douglas-fir breeding units. A seed orchard block representing 50-100 unrelated parent trees would be established for each of these units. Each tree is selected for its superior growth rate or other desirable trait, as demonstrated in the progeny test plantations. Seed orchard trees are produced by grafting a growing stem tip, or scion, from the parent tree to an established rootstock at the orchard site. The purpose of the seed orchard is to produce seed for reforestation, using selected parent trees whose progeny have demonstrated their potential for better growth or other desired traits.

Such selection increases the frequency of certain characteristics in the total population, while reducing the frequency of others. It cannot completely eliminate any of the less desirable characteristics. The gene pool could be broadened by cross-breeding trees that would have been unable to cross pollinate in the wild because of the distance between them. In most cases, however, reforestation seed for any particular area is obtained from parent trees in the same seed zone and elevation band. This assures that the seedlings will be well adapted to the site where they are planted. A significant advantage of the tree improvement program is that the exact location of each female parent is known. This allows the BLM to plant improved seedlings on the same types of sites on which their parents grew.

When trees in a seed orchard block produce cones, a majority of the pollen reaching them will come from other parent trees in the block. This provides the opportunity for new combinations of genes. Studies show that for quantitative traits such as height growth, the number of different genotypes that can be generated through recombination is extremely large (Kang 1980). Therefore, a very diverse population can be created from a relatively small number of individuals which show some genetic diversity. The seed orchards can safely be assumed to provide adequate genetic variability.

Tree breeding has not created a dangerous uniformity in forestry (Ledig 1988). Adams (1981) studied isozymes of Douglas-fir and reported that plantations reforested from the first generation seed orchards are not appreciably less variable than natural populations in the same breeding units. They certainly would be as variable, if not more so, than plantations regenerated from seed of commercial collections or seed trees. He further concluded that tree improvement efforts may lead to a broader genetic base in future populations than that occurring with present regeneration; at least in the earlier generations of breeding programs. Care must be taken to ensure that certain superior families (lines) are not overused in the effort to maximize growth (Ledig 1988).

The Biodiversity section of chapter 4 contains a discussion of the effects of timber management on genetic diversity.

Appendix 2-D Best Management Practices and TPCC Fragile Code Guidance

Best Management Practices

The best management practices (BMPs) described in this document are intended to maintain or improve water quality and soil productivity, and prevent or mitigate adverse impacts while meeting other resource objectives.

The BMPs are designed to provide compliance with the Clean Water Act of 1972, as amended in 1977 and 1987. Section 319 of the 1987 amendments requires that the states determine those waters that will not meet the goals of the Act, determine those nonpoint source activities that are contributing pollution, and reduce such pollution to the maximum extent practicable.

Oregon's administrative rules contain water quality standards for the identified beneficial uses of water in relation to the antidegradation policy (OAR 340, sections: 340-41-026, -282, -285, -362, -365, -962, -965). The following BMPs, which would be selected by an IDT on a site-specific basis, are considered the primary mechanisms to achieve Oregon water quality criteria and would be selected appropriate to project goals.

Riparian Management Areas (RMAs)

- Restrict cross-stream disturbances to corridors which are perpendicular to streams. Management guidelines for corridors:
- Restrict corridors to the minimum number feasible.
- Depending on site limitations, corridors will not normally exceed 50 feet in width or reduce crown cover on a project stream segment to less than 75 percent of predisturbance conditions.
- Fully suspend logs over water and adjacent banks.
- Leave all cut material to benefit fisheries, wildlife and other ecological values unless existing down woody material exceeds the biological requirements of the site.
- If felled trees are needed to meet stream structure and wildlife habitat objectives, leave them in the RMA.
- Manage stream channels for a range of 60-150 pieces of large wood per 1,000 lineal feet of stream. Pieces will have minimum lengths of 10 feet and minimum diameters of six inches. At least half the pieces will interact with at least one-third bankfull channel width.
- Manage RMAs for at least 75 percent site-specific native overstory. For mature/old-growth conifer areas, RMAs will contain 30 conifers per acre over one foot in dbh and 14 conifers per acre over two feet in dbh.
- Allow no mineral lease operations, chemical loading operations or similar toxic pollutant activities within 200 feet of all water bodies.
- Allow no surface occupancy for leasable mineral exploration or development.
- Limit disturbance in immediate vicinity of domestic water diversion points.
- Restrict location of log landings in the vicinity of water.
- Avoid disturbance of unstable banks and headwalls.
- Restrict use of tractors in and adjacent to water. Tractors would be used in stream rehabilitation projects, but within state guidelines.
- Directionally fell timber away from RMAs unless specifically identified to meet other management goals such as fishery and stream rehabilitation projects.
- Plant conifers and woody riparian species in riparian areas where previous management activities have removed them. Placement of woody debris, creation of snag, or planting of conifers and riparian species would be used where appropriate to restore riparian conditions.
- Convert suitable alder and brush riparian areas to conifers where water quality is limited. This will provide for a reduction in nitrates and organic material, and provide new sources for future stream structure (woody debris).
- Manage vegetation to protect or restore springs and wetland areas.
- To the extent practical, keep prescribed fire out of RMAs and protective strips along intermittent streams.

Upland Management

Road design and construction criteria:

- Avoid heavy concentrations of roads and landings to minimize impacts from increased peak flows and erosion of the compacted surfaces.
- Avoid constructing midslope roads.
- Avoid headwalls and unstable ground.
- Revegetate cut and fill slopes by seeding, fertilizing, hydromulching, netting, mulching, or planting.
- Install stabilization features such as debris racks, binwalls, and rock blankets as needed.
- Unless a road is needed for future management, use a temporary road and reclaim and revegetate it after use. Use methods such as blocking, subsoiling, seeding, mulching, fertilizing, and waterbarring.
- Minimize potential erosion on a road. If a road surface is dirt, reclaim and revegetate it; otherwise apply rock to minimize surface erosion.

- Design all drainage structures to withstand a 50-year flood.
- Cut culverts to the proper length, downspout, and provide for energy dissipation.
- Avoid diverting water into headwalls. Roll the grade to channel water away from headwalls.

Existing roads

- Reclaim/revegetate all roads not needed for future management activities.
- If causing problems, revegetate bare cut and fill slopes where needed for maintaining or improving water quality.
- If they fail, replace drainage facilities to withstand a 50-year or 100-year flood where values warrant.
- Stabilize major failures (landslides) by subsurface drainage, rock blankets, or other methods.
- Reconstruct poorly built stream crossings with bridges or culverts, insuring proper alignment and grade.
- Divert road runoff through ditches and cross drains, and provide adequate energy dissipation on slopes.
- Check maintenance to ensure water is not allowed to remain on the road and/or diverted into unstable headwall areas.
- Leave grass in ditches to minimize erosion and sediment delivery to streams unless it is causing accelerated erosion due to rechanneling of water.
- Endhaul waste materials if side slopes exceed 65 percent or where unacceptable environmental damage may occur.

Yarding Systems (aerial)

- In sensitive watersheds, consider using helicopter yarding to avoid or minimize new road construction or to provide complete suspension.
- Place landings away from watercourses to prevent jet fuel or other pollutants from entering the water.

Yarding Systems (cable)

- On areas with high water tables, yard with full suspension or with one-end suspension and restrict the operation to the dry season
- On areas with slopes exceeding 65 percent, yard with full suspension, one-end suspension using seasonal restrictions, or one-end suspension using a standing skyline with lateral yarding capacity. Yard remaining areas using one-end suspension.
- Pile yarding debris on the landing to minimize the acreage around the landing impacted by intense burns or obstructed by heavy slash concentrations.

Yarding Systems (ground based)

- Use existing skid trails.
- Limit new skid trails to slopes less than 35 percent.
- Use designated skid trails to limit area compacted by skid trails and landings to less than 10 percent. Restrict tractor operation to these trails and limit operations periods when soils are resistant to compaction and displacement.
- In partial cut areas, locate skid trails so that they can be used for final harvest.
- Till compacted areas, including skid trails from previous entries, with a properly designed self-drafting winged subsoiler.
- Avoid tractor yarding on areas where soil damage cannot be mitigated due to physical conditions (i.e., TPCC codes FWR1 & FNR1).
- Avoid placement of skid trails through areas of high water tables or where the skid trails would channel water into unstable headwall areas.
- Waterbar skid trails to minimize erosion.
- Avoid use of wide track vehicles or more than one machine on a skid trail at any given time to minimize the width of the skid trails. On multiple pass skid trails, wide track vehicles create wider skid trails, and after multiple passes, drive the compaction deeper than a regular width track. However, they are good for one pass operations.

Broadcast Burning

- An Oregon State Office guide (USDI, BLM 1982) describes a procedure to identify and place soils into three categories - highly, moderately, and least sensitive. These categories are based on the sensitivity of specific soils to impacts from burning:

Category 1 - Highly sensitive soils
- Soils less than 20 inches deep.
- Soils with less than four inches of A horizon.
- Granite and schist soils on slopes exceeding 35 percent.
- Soils on slope gradients exceeding 70 percent.

Category 2 - Moderately sensitive soils
- Moderately deep and deep nonskeletal soils on southerly and westerly aspects with slopes less than 65 percent.
- Moderately deep and deep skeletal soils.
- Granite and schist soils on slopes less than 35 percent.
- Moderately deep and deep soils with ochric epipedons (light colored surface layers).

Category 3 - Least sensitive soils
- All soils not included in categories 1 and 2.

The following is BMP guidance for each category:

Highly sensitive soils - avoid burning.

Moderately sensitive soils - reduce disturbance, fire intensity and duration using the following methods:

- Burn under conditions that create low intensity fires.
- Burn when soils or duff are moist.
- Limit use of tractors in fireline construction, and when used, to areas with less than 35 percent slopes. Construct water bars.
- Avoid burning sparsely vegetated areas on slopes greater than 65 percent.
- Gross yard to break up heavy slash concentrations.

Least sensitive soils - burn by prescription and avoid hot burns.

The BLM manual lists the following maximum desired percent bare soil exposed from burning for the three categories of soils: category 1 - 15 percent; category 2 - 30 percent; category 3 - 40 percent.

Fire Trails

- Use hand constructed fire trails.
- Avoid the use of tractor-constructed fire trails on small units since the percentage of the area impacted is magnified by the unit's small size. Calculate the area compacted from yarding, landings and fire trails. Keep the impacted area to less than 12 percent.
- Construct tractor fire trails using a brush blade with one pass construction when the soil is dry. Make final clearing by hand.
- Where fire trail construction has caused compacted surfaces, till and waterbar fire trails. Use a properly designed winged subsoiler.
- Avoid placement of tractor-constructed fire trails on slopes greater than 35 percent.
- Avoid placement of any fire trails where water would be channeled into areas of instability or headwalls.
- Waterbar fire trails that may carry water to minimize surface erosion.

Mechanical Site Preparation

- Limit the use of tractors to areas with slopes less than 35 percent. Other equipment designed for steeper slopes, such as some wide tracked or walking type slash pilers, may be used on slopes greater than 35 percent.
- Till compacted areas with a properly designed self-drafting winged subsoiler, unless inspection reveals that less than two percent of the area is compacted. Compaction of less than two percent is considered to equal less than one percent growth loss.
- On sites which do not annually dry out enough (udic soils) to provide resistance to bulldozer type equipment, use low ground pressure, tracked-type or walking equipment with slash piling or spot clearing heads.
- On soils with rocky surfaces, such as those coded as FSR1 in the TPCC and those with identified low fertility levels, require excavators for mechanical site preparation, regardless of moisture limitations. These sites are highly sensitive to productivity loss from surface disturbance and compaction. Tillage of the rocky soils (FSR1) is usually beyond equipment capability and will cause a further decrease in productivity due to mixing.

Fertilization

- Avoid aerial application when wind speeds would cause drift.
- Locate heliports and storage areas away from stream channels.
- No fertilizer would be applied to streams or water bodies.

Municipal Watersheds

In addition to the previous listed BMPs, cooperate with affected communities in the development and application of specific constraints and management actions designed to meet their particular needs. Additional protection could include:

- Seasonal and other restrictions on logging.
- Coordination and notification prior to surface disturbing actions.
- Review procedures.
- Sanitary precautions for woods workers.
- Restrictions on access.

Wetlands

Maintain the integrity and functional ability of wetlands. If avoidance is not feasible, protection would be accomplished during management activities by:

- Avoiding disturbance of permanent high water table areas.
- Fall and yard away from wetlands.
- Use seasonal restrictions or full suspension over areas when entry is determined to be required.
- Avoiding the use of tractors or other ground based equipment which may cause disturbance of the wetlands.

Timber Production Capability Classification System

The Timber Production Capability Classification (TPCC) inventory is designed to identify sites capable of sustaining intensive timber management without degradation of their productive capacity. Factors such as soil depth, available moisture, slope, drainage, and stability are evaluated to determine the degree of timber management activity on a particular site. This would include sites capable of sustaining standard timber harvest practices, special practices or limitations to prevent degradation, and sites too fragile to tolerate any timber management without long-term loss of productivity. Legislative requirements and BLM policy specify that timber harvests will be planned and carried out only on lands which can be managed without environmental degradation of the site.

The TPCC inventory is described further in appendix 3-R. A complete description of the system can be found in *BLM State Office Handbook 5251-1, Timber Production Capability Classification*. This is available at the district office.

This section describes the fragile codes used in the TPCC, identifies the concerns associated with each code, and recommends potential practices for management of such areas.

TPCC Fragile Codes/Guidance

Fragile Nonsuitable Woodland — Soil Moisture (FSNW)

Soils on these sites are excessively well drained. Soils have a very low available water holding capacity (AWHC) and are subject to being dry for long periods during spring and summer months. Vegetation communities are primarily uneven-aged, open-grown Douglas-fir with a low vigor ground cover of salal. Soils typically have sandy or gravelly textures with coarse fragments consisting of more that 70 percent of the top 12 inches of the soil. AWHC is generally between 0.5 and 1 inch.

Concerns

Because of the limited soil resource, survival of newly planted vegetation is low. Any site disturbance severely reduces the future productivity potential. These losses cannot be mitigated even using BMPs.

Recommended Practices

These sites should be managed for nontimber uses.

Fragile Suitable Restricted — Soil Moisture (FSR1)

Sites with thin light-colored topsoils and coarse, sandy or gravelly, often shallow soils with low moisture storage capacity. AWHC in the top 12 inches ranges from 1 to 1.5 inches.

Concerns

Because of low moisture supplying capacity and thin topsoil, soil displacement or compaction significantly impacts the growth of biomass. Soil compaction or displacement further reduces the soil's ability to absorb and store moisture, reducing survival and growth of conifer seedlings.

Recommended Practices

- Avoid ground based logging equipment.
- Avoid wet season yarding except with suspension of logs.
- Avoid scarification or tilling of soil.
- Avoid tractor-constructed fire trails.
- Burn slash only when fire intensity will be low (see burning guidelines).

Fragile Suitable Restricted — Compaction (FSR2)

More than 12 percent of the area is compacted or the area was scarified and a high percentage of the topsoil is compacted and/or displaced.

Concerns

Soil compaction and displacement causes reduced survival and growth of planted conifers. Increased runoff and erosion may be occurring from the compacted surfaces.

Recommended Practices

- Till with properly designed winged subsoiler.
- Add organic matter to surfaces of displaced soil to improve productive potential.
- Where sites have been completely cleared of debris and topsoil, replace topsoil by dragging and respreading topsoil from piles or concentrations.
- Drain low spots or blocked drainages to improve natural drainage.
- Use nitrogen-fixing plants to enhance nutrient levels on severely disturbed sites.

Fragile Nonsuitable Woodland — Nutrient (FNNW)

Soils on these sites are low in nutrients or have a nutrient imbalance that inhibits tree growth. Soils on this site are very gravelly or shallow, generally mapped

with FSNW, or already produce less than 20 cubic feet per acre per year.

Concerns

Forest management activities reduce site productivity below the threshold level for commercial forest (20 cubic feet per acre per year).

Recommended Practice

Manage for nontimber uses.

Fragile Suitable Restricted — Nutrient (FNR1)

Soils on this site are typically well to excessively drained. They occur primarily on ridges and ridge noses or steep (>70 percent) convex hillslopes, at elevations typically above 2,800 feet (Salem District). Parent material is frequently volcanic tuff or breccia, and high in ash. Soils typically have thin topsoils. Organic matter turnover rates are slow and a high proportion of site nutrients is stored in the above ground biomass. Associated vegetation consists of primarily Pacific silver fir and noble fir with associated cold-tolerant understory species such as rhododendron and beargrass.

Concerns

The highest demand for plant nutrients occurs during the first 15-20 years after a plantation is established. Removal of nitrogen on sites already below optimum levels for growth would have an immediate impact on new plantations. While soil nutrients can be replaced after 80-100 years through natural precipitation, nutrients in deficient soils will not be available in sufficient quantities during the period of maximum need by the young stand of trees. Studies indicate that scarification and burning that cause high biomass removal on nutrient-deficient soils could have an immediate detrimental impact on growth.

Recommended Practices

- Avoid burning on these sites when possible. Usually plant competition is not a factor on low fertility sites. (see burning guidelines)
- Avoid burning on steeper slopes and southerly aspects.
- Encourage nitrogen-fixing vegetation.
- Use fertilizer to increase nutrient levels.
- Avoid use of ground based yarding equipment such as tractors and rubber-tired skidders.
- Avoid scarification and tractor slash piling.
- Plant and thin trees to wider spacings.
- Consider extended rotations.

Fragile Suitable Restricted - Nutrient - Impacted From Past Management (FNR2)

Lower fertility sites impacted by yarding, scarification, or slash burns, resulting in lowered site productivity.

Concerns

Site productivity has been significantly reduced by loss of soil nutrients and organic matter.

Recommended Practices

- Encourage growth of nitrogen-fixing plants.
- Thin trees to wider spacings.
- Use chemical fertilizers to increase soil nutrients.

Fragile Suitable (very) Restricted — Nutrient (FNR3)

Very slow-growing stands of Douglas-fir and hemlock at higher elevations. Understory includes low vigor rhododendron and beargrass.

Concerns

Any loss of soil nutrients from logging could shift these areas into a low site category.

Recommended Practices

- Use practices listed for TPCC FNR1.
- Do not burn.
- Do not use ground based equipment.
- Keep any soils disturbance to a minimum.

Fragile Nonsuitable Woodland — Slope Gradient (FGNW)

Slopes greater than 80 percent adjacent to streams and in headwalls of drainages.

Concerns

Logging or road construction activity is likely to accelerate surface erosion and/or trigger slides or debris avalanches into streams.

Recommended Practices

- Manage for uses other than timber production with a primary emphasis on maintaining water quality.
- Avoid and buffer these sites whenever possible, especially if there are indicators of instability.
- If included in timber sale units, fall and yard away or use full suspension. Buffer the headwalls or streams.

Fragile Suitable Restricted — Slope Gradient (FGR1)

Steep slopes of 70-80 percent adjacent to streams or in headwalls of drainages. Soils are shallow to moderately deep, noncohesive and gravelly.

Concerns
Logging or road construction may accelerate soil erosion, ravelling and sliding; may contribute to debris avalanches. When such materials enter streams, there are serious impacts to water quality and riparian (streamside) vegetation.

Recommended Practices
- Avoid placing roads in headwalls steeper than 70 percent or minimize sidecasting of excess road construction materials.
- Avoid practices that add water to headwalls or disrupt the natural drainage.
- Monitor culverts in high hazard areas during high runoff events.
- Avoid placement of new materials into slide areas.
- Direct road runoff into ditch lines by insloping or use of dips.
- Place downspouts on culverts where they discharge onto steep slopes.
- Yard logs using full suspension.

Fragile Nonsuitable Woodland — Mass Movement Potential (FPNW)

These sites have active deep-seated slump-earthflow mass movements. Vegetation is primarily alder, bigleaf maple, Douglas-fir, and hemlock, with understories of vigorous sword fern, salmonberry, and other water-tolerant species. The trunks of many of the trees are commonly curved and leaning in various directions. Sites include areas (a) which are unproductive because the soils have been removed by past sliding, (b) where movement rates are rapid, precluding even shortened harvest rotations, or (c) where movement rates are resulting in jack strawed trees.

Concerns
Management activities could cause accelerated slope movement and slope failures. Because of the rapid rates of movement, forest management is not feasible on these sites.

Recommended Practices
- Avoid disturbance on these areas.
- Avoid unloading bottoms of slides.
- Avoid loading tops of slumps.
- Divert road drainage away from unstable areas.
- Evaluate unstable slopes and design measures to enhance their stability.

Fragile Suitable Restricted — Mass Movement Potential (FPR1)

These sites occur primarily in undulating topography containing depressions and sag ponds. Parent material is primarily sedimentary rock associated with parallel bedding planes, with sills of diorite, or with tuff and breccia. Slopes of the slump scarp may be steep but the average hillslope is on gradients of less than 60 percent. Soils are typically deep and highly productive.

Vegetation varies depending on the depth to a water table ranging from Douglas-fir and salal to sag ponds with swordfern, oxalis, devils club, and associated water-tolerant species. Sites actively moving contain curved conifer stems and may contain tension cracks and sag ponds.

Concerns
These sites are subject to slow mass movement. Any practice that increases weight or soil pore pressure, or reduces support at the toe, accelerates movement. Runoff from compacted soil on roads and skid trails that diverts water into unstable areas is a common cause of increased instability.

Recommended Practices
- Avoid unloading bottoms of slides.
- Avoid loading tops of slumps.
- Divert road drainage away from unstable areas.
- Maintain or reestablish natural drainage after harvest operations.
- Evaluate unstable slopes and design measures to enhance their stability.

Fragile Nonsuitable Woodland — Surface Erosion Potential (FMNW)

Sites that occur on slopes greater than 90 percent not adjacent to streams or headwalls. The coarse, usually somewhat shallow soil is moving downslope, accumulating on the upper sides of trees and other obstacles.

Concerns
The disturbance from timber harvest or slash burning increases surface erosion to a greater rate. This creates unacceptable losses in potential productivity.

Recommended Practices
Manage for uses other than timber production with the primary emphasis on erosion control, watershed and other nontimber uses.

Fragile Suitable Restricted — Surface Erosion Potential (FMR1)

Sites with steep, convex (upper) sideslopes of 70-90 percent. Parent materials are primarily thick-bedded sandstone, marine basalt, or andesite. Soils typically have shallow, gravelly, thin topsoils. Vegetation is primarily drought-tolerant Douglas-fir with an understory of Oregon grape, salal, and/or rhododendron.

Concerns

Disturbances from logging and slash burning create increased dry ravelling of soil, losses of soil nutrients, and covering of newly planted seedlings.

Recommended Practices

- Use full log suspension when feasible. Otherwise, employ one-end suspension during dry soil conditions, or use an energized carriage with lateral yarding capabilities. Minimize the amount of the area impacted by cable yarding skid trails.
- Avoid burning to maintain vegetative cover and the duff layer.
- Leave large cull logs on the unit to help impede soil movement.
- Encourage nitrogen-fixing plants.
- Consider grass or forb seeding on disturbed areas where moisture is not a limiting factor.

Fragile Nonsuitable Woodland — Ground water (FWNW)

Very poorly drained areas, with water at the surface for much of the year. Vegetation includes scattered alder and cottonwood with an understory of salmonberry, skunk cabbage, sedges or rushes, and devils club.

Concerns

Commercial conifer trees are unable to survive on these sites except on scattered hummocks or mounds with better drainage. The high water table makes it easily damaged by timber management or other activities.

Recommended Practices

Manage for uses other than timber production with primary emphasis on water quality and wildlife.

Fragile Suitable Restricted — Ground water (FWR1)

Very moist, poorly drained sites. Usually in depressions or adjacent to streams or unstable areas where the water table is near the surface much of the year. Vegetation is dominated by alder and western hemlock overstories, and oxalis, vine maple, and swordfern understories. Salmonberry and devils club are minor components.

Concerns

These sites may contain water-tolerant species, but removal of trees could reduce transpiration rates. Yarding may disrupt surface water flows. This can raise the water table and increase the time in which soils are wet. This, in turn, could reduce production, increase competition of unwanted vegetation, and change the adapted species.

Recommended Practices

- Minimize practices that disrupt natural drainage, such as dragging logs through wet areas or leaving skid trails that block natural drainage.
- Avoid use of ground-based logging equipment when soils are wet.
- Avoid scarification.
- Seed ground cover to reduce invasion of water-tolerant vegetation.
- Plant species adapted to the site, such as western hemlock, western redcedar, or alder. Avoid planting Douglas-fir.

Appendix 2-E Management of Candidate ACECs Dropped from ACEC Consideration

Site	Acres	Site Description/Reason Not Proposed	Alt.	Managed for:
Brightwood Bog	12	High elevation cold bog supporting a large stand of cedar trees and exhibiting cedar nurse log process./It is likely that similar sites are found in the general area; need for special management is not apparent.	NA	MU
			A	MU
			B	MU
			C	BD-35%
			D	VRM II
			E	VRM I
			PA	CA-2
Clackamas River	67	Willamette Valley forested riparian habitat on alluvial terrace deposits./ Similar areas exist in the region; this site is not unique.	NA	MU
			A	MU
			B	MU
			C	BD-35%
			D	VRM II
			E	VRM I
			PA	GFMA
Down and Out	27+	An area providing habitat for Poa marcida. Site would also provide a caution zone for the existing Sheridan Peak ACEC./This area is similar to numerous other areas of Poa marcida habitat; site is not unique.	NA	MU
			A	MU
			B	MU
			C	BD-R&R
			D	HCA
			E	MU
			PA	OGEA-2
Grassy Overlook	28	Habitat for *Pleuricospora fimbriolata./ Pleuricospora fimbriolata* does not qualify as important as defined in BLM Manual 1617. The site is similar to other areas in the region.	NA	MU
			A	MU
			B	MU
			C	VRM II
			D	HCA
			E	ACEC
			PA	OGEA-2
Little N.F Wilson R.	1,620	Area of important wildlife and riparian habitat./Majority of values occur on private lands on which BLM has no management jurisdiction. BLM owns a very small portion of this area.	NA	MU
			A	MU
			B	MU
			C	BD-R&R,-35%
			D	MU
			E	MU
			PA	OGEA-1
Lukens Creek	560	Steep, north-facing slopes adjacent to Lukens Creek, a major steelhead spawning area./Area does not pose a significant threat to human life. Soils and plant communities are not uncommon. Fisheries values are not currently or potentially threatened.	NA	MU
			A	MU
			B	MU
			C	BD-35%
			D	MU
			E	TPCC
			PA	GFMA
Marmot/ Sleepy Hollow	637	Site located in Mt. Hood travel corridor viewshed; contains wildlife habitat, domestic watershed, scenic, and historic landscape scenery values./Wildlife habitat is not unique or unusual in the region. Scenic value is not significant in terms of entire viewshed.	NA	MU
			A	MU
			B	SSB
			C	BD-R&R
			D	VRM II
			E	VRM I
			PA	CA-2

Appendix 2-E Management of Candidate ACECs Dropped from ACEC Consideration (Continued)

Site	Acres	Site Description/Reason Not Proposed	Alt.	Managed for:
Ringo	80	A natural system/process characterized by	NA	MU
		a mature redcedar/Douglas fir stand in a	A	MU
		low elevation, northern Willamette Valley	B	MU
		setting./This site is not a representative	C	BD-35%
		or natural stand, nor is it uniquely	D	VRM II
		qualified for research, one-of-a-kind, or	E	VRM I
		even especially rare.	PA	GFMA
Siletz River	7	A site containing bald eagle and great	NA	MU
		blue heron habitat in an old growth Sitka	A	MU
		spruce community along an upper tidal zone. B	MU	
		/Research value has not been established.	C	BD-35%
		No threat to resource values, (riparian	D	MU
		and anadromous fish habitat), if land	E	VRM II
		exchange is not approved.	PA	GFMA
Table Mtn.	649	An area containing ecological and natural	NA	MU
		systems/process values./Area does not	A	MU
		provide unique or unusual wildlife habitat. B	MU	
		Nepheline syenite present in the area is	C	MU
		unique, but not geologically sensitive.	D	MU
			E	MU
			PA	CA-1
Tally Creek	136	Site contains a mix of mesic and xeric	NA	MU
		plant species in the interstitial zone	A	MU
		between the high and low Cascades./This	B	MU
		mix of species is not unusual in this	C	BD-35%
		general vicinity.	D	MU
			E	HP
			PA	GFMA
Waterloo	13	Diverse habitat area containing mesic and	NA	MU
		dry forests and grassy glades./This is an	A	MU
		impacted system, (previous logging and	B	MU
		grazing), and is not a natural, native	C	MU
		system.	D	MU
			E	MU
			PA	GFMA

MU = Multiple use - timber, minerals, etc.
BD-R&R = Biological diversity, restoration & rehabilitation block
BD-35% = Biological diversity, 35% basal area retention
VRM I = Visual resource management, class I
VRM II = Visual resource management, class II
CA-1 = Connectivity area, 150-year timber harvest rotation
CA-2 = Connectivity area, 200-year timber harvest rotation
GFMA = General forest management area (primarily timber production)
HCA = Habitat Conservation Area (spotted owl)
OGEA-1 = Old-growth emphasis area, 300-year timber harvest rotation
OGEA-2 = Old-growth emphasis area, 200-year timber harvest rotation
OGEA-3 = Old-growth emphasis area, 150-year timber harvest rotation
HP = Habitat protection
SSB = Seral stage block

Source: WODDB and district special area files.

Appendix 2-F Management Guidelines and Standards for National Wild and Scenic Rivers

The Wild and Scenic Rivers Act (Public Law 90-542 as amended) established a method for providing federal protection for selected remaining free flowing rivers, and preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system to benefit from the protective management and control of development for which the act provides. The following guidelines and standards are extracted in part from the February 3, 1970 and August 26, 1982, Department of the Interior and Department of Agriculture guidelines. They would apply to formally designated rivers through incorporation in formal management plans which are normally developed within three years of designation. The guidelines also apply, on an interim basis, to BLM-administered lands along BLM study rivers and other rivers or river segments which have been found by the BLM to be eligible for inclusion as components of the National Wild and Scenic River (W&SR) System. In the latter instance, interim application of the guidelines would continue until lifted by a determination of nonsuitability through BLM's planning (RMP) process or by Congressional action.

Section 10(a) of the act states that:

> "Each component of the national wild and scenic rivers system shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protecting its aesthetic, scenic, historic, archaeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area."

This section is interpreted by the secretaries of the Interior and Agriculture departments as stating a nondegradation and enhancement policy for all designated river areas, regardless of classification.

Congress, with presidential approval, may determine which river segments will be added to the W&SR system. When a river is designated, and the BLM is identified as the administering federal agency, the BLM would establish administrative boundaries to protect the identified outstandingly remarkable values. By law, the land inside the boundaries normally may not exceed an average of 320 acres per river mile over the designated portion of the river. The BLM would delineate boundaries based on natural or manmade features (canyon rims, roads and ridge tops, etc.) and with consideration of legally identifiable property lines.

A river management plan must also be completed for each designated river by the administering federal agency within three years after designating legislation. Existing state, local and federal laws continue in effect during the interim along with general Department of the Interior guidelines. If federal designation overlaps state scenic waterway designation, a joint federal/state management plan could be developed. Each management plan would address the roles of federal, state, county and relevant Indian tribal governments in management of the river.

Discussion of BLM's inventory to determine which river segments are eligible for inclusion as components of the W&SR system is presented in chapter 3 and appendix 3-P. Included in appendix 3-O is a discussion of the criteria for eligibility for each river area classification (wild, scenic, recreational) for which any river reviewed has been determined eligible. The results of BLM's eligibility determination process is presented in appendix 3-P.

Management Objectives Common to Wild, Scenic and Recreational River Areas

Fire Protection and Suppression. Management and suppression of fires within a designated river area would be carried out compatible with contiguous federal lands. On wildfires, suppression methods would be utilized that minimize long-term impacts on the river and river area. Presuppression and prevention activities would be conducted to reflect management objectives for the specific river segment. Prescribed fire may be used to maintain or restore ecological condition or meet objectives of the river management plan.

Insects, Diseases and Noxious Weeds. The control of forest and rangeland pests, diseases and noxious weed infestations would be carried out compatible with the intent of the Act and management objectives of contiguous federal lands.

Cultural Resources. Historic and prehistoric resource sites would be identified, evaluated and protected in a manner compatible with the management objectives of

the river and in accordance with applicable regulations and policies. Where appropriate, historic or prehistoric sites would be stabilized, enhanced and interpreted.

Water Quality. Water quality would be maintained or improved to meet federal criteria or federally approved state requirements. River management plans shall prescribe a process for monitoring water quality on a continuing basis.

Fish and Wildlife Habitat Improvement. The construction and maintenance of minor structures for the protection, conservation, rehabilitation or enhancement of fish and wildlife habitat are acceptable. This is provided they do not affect the free flowing characteristics of the river area, are compatible with the river area's classification, the area remains natural in appearance, and the practices or structures are compatible with the surrounding environment.

For clarity sake, the following guidelines are presented for each separate river area classification (recreational, scenic and wild).

Recreational River Areas

Recreational river areas are defined by the act to be "Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past."

Management Objective for Recreational River Areas

Management of recreational river areas should give primary emphasis to protecting the values which make them outstandingly remarkable while providing river-related outdoor recreation opportunities in a recreational setting. Recreational classification is a determination of the level of development and does not prescribe or assume recreation development or enhancement. In general, a variety of agricultural, water management, silvicultural, recreational, and other practices or structures are compatible with recreational river values, providing such practices or structures are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment.

Management Standards for Recreational River Areas

Forestry Practices. Forestry practices including timber harvest would be allowed under standard restrictions to avoid adverse effects on the river environment and its associated values.

Hydroelectric Power and Water Resource Development. No development of hydroelectric power facilities would be permitted. Existing low dams, diversion works, rip rap and other minor structures may be maintained provided the waterway remains generally natural in appearance. New structures may be allowed provided that the area remains generally natural in appearance and the structures harmonize with the surrounding environment.

Mining. New mining claims are allowed and existing operations can continue subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect values of rivers included in the W&SR System. All mineral activity on federally administered land must be conducted to minimize surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access would be permitted. Mining claims, subject to valid existing rights, within the recreational river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).

Road and Trail Construction. Existing parallel roads can be maintained on one or both river banks. There can be several bridge crossings and numerous river access points. Roads, trails, and visitor areas must conform to construction and maintenance standards and be free of recognized hazards.

Agricultural Practices and Livestock Grazing. Lands may be managed for a full range of agriculture and livestock grazing uses, consistent with current practices.

Recreation Facilities. Interpretive centers, administrative headquarters, campgrounds and picnic areas may be established in proximity to the river. However, recreational classification does not require extensive recreation development.

Public Use and Access. Recreation use including, but not limited to, hiking, fishing, hunting and boating is encouraged in recreational river areas to the extent consistent with the protection of the river environment. Public use and access

may be regulated and distributed where necessary to protect and enhance recreational river values. Any new structures must meet established safety and health standards or in their absence be free of any recognized hazard.

Rights-of-Way. New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically authorized by other plans, orders and laws. Where no reasonable alternate location exists, additional facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques would be selected to minimize adverse effects on recreational river area values and fully evaluated during the site selection process.

Motorized Travel. Motorized travel on land would generally be permitted on existing roads. Controls would usually be similar to that of surrounding lands. Motorized travel on water would be in accordance with existing regulations or restrictions.

Scenic River Areas

Scenic river areas are defined by the act to be "Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads."

Management Objective for Scenic River Areas

Management of scenic river areas should maintain and provide outdoor recreation opportunities in a near-natural setting. In general, a wide range of agricultural, water management, silvicultural and other practices or structures could be compatible with scenic river area values. However, such practices must be implemented without a substantial adverse effect on the river and its immediate environment.

Management Standards for Scenic River Areas

The same limitations set forth for recreational river areas are applicable, except that developments should harmonize with the environment, and any developments on shore lands should be screened from the river. The following program management standards apply:

Forestry Practices. Silvicultural practices including timber harvesting could be allowed, provided they cause no substantial adverse effect on the river and its immediate environment. The river area should be maintained in its near-natural condition. Timber outside the boundary, but within the visual impact area, should be managed and harvested with a special emphasis on visual quality. Preferably, reestablishment of tree cover would be with natural vegetation. Fuelwood cutting would be limited to dead or down materials. Where necessary, restrictions on use of wood for fuel may be prescribed.

Hydroelectric Power and Water Resource Development. No development of hydroelectric power facilities would be permitted. Flood control dams and levees would be prohibited. All water supply dams and major diversions are prohibited. Maintenance of existing facilities and construction of some new structures would be permitted provided the area remains natural in appearance and the practices or structures harmonize with the surrounding environment.

Mining. New mining claims and mineral leases would be allowed. They would be subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect the values of rivers included in the W&SR System. All mineral activity on federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access would be permitted. Mining claims, subject to valid existing rights, within the scenic river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).

Road and Trail Construction. Roads or trails may occasionally bridge the river area and short stretches of conspicuous roads or long stretches of inconspicuous and well-screened roads could be allowed. Maintenance of existing roads and trails and any new roads or trails would be based on the type of use for which the roads/trails are constructed and the type of use that would occur in the river area.

Agricultural Practices and Livestock Grazing. A wide range of agricultural and livestock grazing uses is permitted to the extent currently practiced. Row crops are not considered as an

intrusion of the largely primitive nature of scenic corridors as long as there is not a substantial adverse effect on the natural appearance of the river area.

Recreation Facilities. Larger-scale public use facilities, such as moderate-sized campgrounds, interpretive centers, or administrative headquarters would be allowed if such facilities are screened from the river.

Public Use and Access. Recreation use including, but not limited to, hiking, fishing, hunting and boating is encouraged in scenic river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance scenic river values.

Rights-of-Way. New transmission lines, natural gas lines, etc., are discouraged unless specifically authorized by other plans, orders or laws. Where no reasonable alternate location exists, additional facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques would be selected to minimize adverse effects on scenic river area related values and fully evaluated during the site selection process.

Motorized Travel. Motorized travel on land or water may be permitted, prohibited or restricted to protect river values. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.

Wild River Areas

Wild rivers areas are defined by the act to include "Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America."

Management Objective for Wild River Areas

Management of wild river areas should give primary emphasis to protecting the values which make them outstandingly remarkable while providing river-related outdoor recreation opportunities in a primitive setting.

Management Standards for Wild River Areas

Forestry Practices. Cutting of trees would not be permitted except in association with a primitive recreation experience, such as clearing for trails, visitor safety, or through control of fires to protect the environment. Trees outside the boundary, but within the visual corridors should, where feasible, be managed and harvested in a manner to provide special emphasis to visual quality.

Hydroelectric Power and Water Resource Development. No development of hydroelectric power facilities would be permitted. No new flood control dams, levees, or other works are allowed in the channel or river corridor. All water supply dams and major diversions are prohibited. The natural appearance and essentially primitive character of the river area must be maintained. Federal agency ground water development for range, wildlife, recreation or administrative facilities may be permitted if there are no adverse effects on outstandingly remarkable river-related values.

Mining. New mining claims and mineral leases are prohibited on federal lands constituting the river bed or bank or located within 1/4 mile from the ordinary high water mark on both sides of the river. Valid existing claims would not be revoked. Existing mining activity would be allowed to continue. This would be subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect the rivers included in the W&SR System. All mineral activity on federally administered land must be conducted to minimize surface disturbance, water sedimentation, pollution, and visual impairment. Reasonable mining claim and mineral lease access would be permitted. Mining claims, subject to valid existing rights, within the wild river area boundary can be patented only to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).

Road and Trail Construction. No construction, new roads, trails, or other provisions for overland motorized travel would be permitted within the river corridor. A few inconspicuous roads or unobtrusive trail bridges leading to the boundary of the river area may be permitted.

Agricultural Practices and Livestock Grazing. Agricultural use is restricted to a limited amount of domestic livestock grazing and hay production to the extent practiced prior to designation. Row crops are prohibited.

Recreation Facilities. Major public use facilities, such as campgrounds, interpretive centers, or administrative headquarters would be located outside wild river areas. Toilets, tables, fireplaces, shelters and refuse containers may be provided as necessary within the river area. These should harmonize with the surroundings. Unobtrusive hiking and horseback riding trail bridges could be allowed on tributaries, but would not normally cross the designated river.

Public Use and Access. Recreation use including, but not limited to, hiking, fishing, hunting and boating is encouraged in wild river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance wild river values.

Rights-of-Way. New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically authorized by other plans, orders or laws. Where no reasonable alternate location exists, additional facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques would be selected to minimize adverse effects on wild river area values and fully evaluated during the site selection process.

Motorized Travel. Motorized travel on land or water could be permitted, but is it generally not compatible with this river area classification. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.

Oregon Scenic Waterways Act

In 1969 the state of Oregon passed the Oregon Scenic Waterways Act. This legislation established a program that protects designated rivers throughout Oregon. It is administered by the Oregon Department of Parks and Recreation. Its goals are to protect the free flowing character of designated rivers for fish, wildlife and recreation. Dams, reservoirs, impoundments and placer mining are prohibited on state scenic waterways. The act requires state review of new development along designated rivers, but it does not affect existing water rights, development or uses.

Management Constraints on Private Lands

Designation of a river under the W&SR Act gives the federal government no authority to regulate or zone private lands. Land use controls on private lands are solely a matter of state and local zoning regulations. Although the W&SR Act includes provisions encouraging the protection of river values through state and governmental land use planning, these provisions are not binding on local governments. The federal government is responsible for assuring that designated rivers are managed in a manner which meets the intent of the W&SR Act.

River management plans may prescribe land use or development limitations to protect outstandingly remarkable river values. Many uses may be compatible with a wild, scenic or recreational river area classification as long as the rivers are administered to protect and enhance the values which caused them to be included in the W&SR System. Most existing uses and activities on adjoining private lands may continue. Timber harvest activities on private lands within a W&SR boundary would continue to be regulated by the Oregon Forest Practices Act.

The primary consideration in any river or land use limitation would be the protection and enhancement of a designated river's outstandingly remarkable value(s). The BLM would work closely with landowners to assure that all uses would be consistent with the intent of the W&SR Act. Uses that clearly threaten identified outstandingly remarkable values would be addressed on a case-by-case basis.

Specific management goals for new buildings, other structures or road construction on private lands along designated rivers would be addressed through the individual river management plans. Federal guidelines allow different degrees of development along river areas classified as wild, scenic or recreational. In consultation with landowners involved, every effort would be made to reduce adverse impacts to an acceptable level on proposals for major upgrading, realignment and/or new construction of roads. Maintenance of existing roads would generally not alter a river area's condition and thus would not be restricted.

On designated rivers, the BLM could negotiate with a landowner to purchase specific development rights necessary to prevent any threat to the river area's identified outstandingly remarkable values if all other efforts fail to reduce anticipated adverse impacts to an acceptable level. Another option, where mutually agreeable, would be a land exchange providing the

private landowner with comparable lands outside the administrative boundary of a river.

The W&SR Act specifically prohibits the use of condemnation in the fee title purchase of lands if 50 percent or more of the land within the boundary is already in public ownership. While the act provides the federal government authority to purchase scenic, conservation or access easements through condemnation proceedings, this is considered to be a measure of last resort. In the event condemnation were considered necessary, the only landowner rights purchased would be those considered necessary to prevent the identified threat to the river.

If the BLM acquires an easement on private land, depending upon its terms and conditions, public access rights may or may not be involved. For example, a scenic easement could only involve the protection of narrowly defined visual qualities with no provisions for public use. A trail or road easement would involve public use provisions. Provisions for public use of private lands must be specifically purchased from the landowner. The BLM would work closely with landowners to minimize public use of nonfederal lands, through brochures, maps, signs and/or other appropriate means, except in locations where rights to such use are acquired.

W&SR designation does not affect a private landowner's rights to control trespass. Landowners can charge a fee for crossing private lands to fish designated rivers except where a public access easement exists. The designation of a river into the W&SR system does not change landowner rights unless all or a portion of these use rights are acquired from the landowner.

On navigable rivers, the riverbed and banks to the mean high water mark are state lands and are available under state laws for public use. Private landowners control public access to their property along the banks of nonnavigable rivers. The designation of a river into the W&SR System has no bearing upon the determination of navigability.

Ownership and use of valid water rights are not affected by a W&SR designation.

Appendix 2-G
Land Ownership Adjustment Criteria

The following criteria would be used to evaluate opportunities for disposal or acquisition of lands to meet resource management objectives for multiple use and sustained yield. This is in accordance with FLPMA and other laws, executive orders, departmental and bureau policy. This list is not all inclusive.

- Threatened, endangered or sensitive plant and animal species habitat
- Riparian areas and wetlands
- Fish habitat
- Nesting/breeding habitat for game and nongame animals
- Key big game seasonal habitat
- Developed recreation sites and recreation use areas
- High quality scenery
- Energy and mineral potential
- Land adjacent to rivers eligible for designation under the National Wild and Scenic Rivers Act
- Public health and safety
- Significant cultural resources and sites eligible for inclusion on the National Register of Historic Places
- Designated wilderness areas and areas being studied for possible wilderness designation
- Accessibility of the land for public recreation and other uses
- Amount of public investments in facilities or improvements and the potential for recovering those investments
- Difficulty or cost of administration (manageability)
- Suitability of the land for management by another federal agency
- Significance of the decision in stabilizing business, social and economic conditions, and/or lifestyles
- Whether private sites exist for the proposed use
- Encumbrances, including but not limited to, withdrawals or existing leases or permits
- Consistency with cooperative agreements and plans or policies of other agencies
- Suitability (need for change in land ownership or use) for purposes including but not limited to community expansion or economic development, such as industrial, residential, or agricultural (other than grazing) development

Township	Section	Subdivision	Acres	Status
T. 4 S., R. 1 W.	22	Un Lot	.50	PD
T. 4 S., R. 3 W.	2	Lot 1	.25	PD
T. 4 S., R. 3 W.	26	Lot 14	6.75	PD
T. 4 S., R. 3 W.	34	Lots 1, 2	4.40	PD
T. 4 S., R. 3 W.	35	Lot 13	8.34	OC
T. 4 S., R. 10 W.	19	Lot 1, 15	77.75	PD
T. 4 S., R. 10 W.	28	Lot 3	0.53	PD
T. 5 S., R. 3 W.	4	Lot 1	1.16	PD
T. 5 S., R. 3 W.	11	Lot 1	15.06	OC
T. 5 S., R. 4 W.	27	Lot 1	13.00	OC
T. 5 S., R. 5 W.	13	Lot 3	.05	OC
T. 5 S., R. 5 W.	31	Lot 1	3.57	OC
T. 5 S., R. 5 W.	34	Lot 1	.93	PD
T. 5 S., R. 5 W.	35	Lot 1	8.00	OC
T. 5 S., R. 10 W.	5	UN Lots	2.07	PD
T. 5 S., R. 10 W.	20	SENE	40.00	PD
T. 5 S., R. 10 W.	34	NNE, NENW	120.00	PD
T. 6 S., R. 3 W.	2	Lot 2	.20	PD
T. 6 S., R. 3 W.	5	Lot 1	2.00	OC
T. 6 S., R. 1 E.	13	ENW, SWNW	120.00	OC
T. 6 S., R. 1 E.	25	NWNE, SENW	80.00	OC
T. 6 S., R. 6 W.	35	Lot 1	28.40	OC
T. 6 S., R. 10 W.	20	NESW, NWSE	80.00	PD
T. 6 S., R. 10 W.	26	NWNW	40.00	PD
T. 6 S., R. 10 W.	35	SENE	40.00	PD
T. 7 S., R. 1 E.	1	SESW	40.00	OC
T. 7 S., R. 1 E.	23	SESE	40.00	OC
T. 7 S., R. 3 W.	29	Lot 3	5.42	OC
T. 7 S., R. 6 W.	34	SWSE	40.00	OC
T. 7 S., R. 10 W.	20	NE	160.00	PD
T. 7 S., R. 10 W.	30	WNE, SENE, ESE	200.00	PD
T. 8 S., R. 1 E.	3	SWNW, SW	200.00	OC
T. 8 S., R. 1 E.	27	NESW	40.00	OC
T. 8 S., R. 1 E.	35	Lots 1,2, NWNW, 52	400.22	OC
T. 8 S., R. 4 W.	24	M&B	1.54	OT
T. 8 S., R. 4 W.	25	M&B	.08	OT
T. 8 S., R. 10 W.	20	WNWNW	20.00	PD
T. 8 S., R. 11 W.	3	Lot 8	4.73	PD
T. 9 S., R. 1 W.	21	Lot 7, NWNE	84.21	OC
T. 9 S., R. 3 W.	21	Lot 3	.08	OT
T. 9 S., R. 3 W.	24	Un Lot	1.40	PD
T. 9 S., R. 3 W.	32	Lot 2	4.60	PD
T. 9 S., R. 4 W.	9	Lot 5	1.16	OC
T. 9 S., R. 4 W.	14	Lot 9	.17	PD
T. 9 S., R. 5 W.	32	Lots 1, 2	2.90	PD
T. 9 S., R. 9 W.	19	Por. Lot 29	10.00	PD
T. 9 S., R. 9 W.	33	Lot 17	20.00	PD
T. 9 S., R. 9 W.	34	WNWSW	20.00	PD
T. 9 S., R. 10 W.	26	SWNW	40.00	PD
T. 9 S., R. 10 W.	36	POR. Lots 5, 6	10.00	PD
T. 9 S., R. 11 W.	1	Lot 6	1.46	PD
T. 9 S., R. 11 W.	4	SWSW	40.00	PD

Township	Section	Subdivision	Acres	Status
T. 10 S., R. 2 W.	8	Lot 1	6.13	PD
T. 10 S., R. 3 W.	24	Lot 6	.90	PD
T. 10 S., R. 4 W.	11	Lot 5	1.52	OC
T. 10 S., R. 5 W.	19	Lots 1-4, NE, ENW, ESW	480.00	OC
T. 10 S., R. 5 W.	23	Lot 4	0.79	OC
T. 10 S., R. 5 W.	29	NENE, NSW, NSE	145.00	OC
T. 10 S., R. 6 W.	22	Lots 2, 3	15.70	PD
T. 10 S., R. 7 W.	18	SWNE, SESW, WSE	160.00	PD
T. 10 S., R. 10 W.	2	Lot 20	20.00	PD
T. 11 S., R. 3 W.	1	Lot 11	.15	OT
T. 11 S., R. 7 W.	14	Lot 5	.14	PD
T. 11 S., R. 7 W.	23	Lots 1, 2	1.39	OT
T. 11 S., R. 8 W.	6	NESW, NWSE, SESE	120.00	PD
T. 11 S., R. 9 W.	31	Lot 2	43.25	PD
T. 11 S., R. 10 W.	12	NNE, NWSW, NESE	160.00	PD
T. 11 S., R. 10 W.	14	Lot 1	2.87	PD
T. 11 S., R. 10 W.	15	Lot 13	3.85	PD
T. 11 S., R. 10 W.	23	NESE	40.00	PD
T. 11 S., R. 10 W.	24	SWSW	40.00	PD
T. 11 S., R. 10 W.	25	Lot 1	37.22	PD
T. 11 S., R. 10 W.	35	SESE	40.00	PD
T. 12 S., R. 3 E.	23	SESW, SWSE	80.00	PD
T. 12 S., R. 4 E.	30	SESW	40.00	PD
T. 12 S., R. 4 E.	31	Lot 1, NENW	84.81	PD
T. 12 S., R. 1 W.	34	Lot 10	11.45	PD
T. 12 S., R. 2 W.	13	Lot 6	7.04	OT
T. 12 S., R. 4 W.	1	Lot 3	.23	OC
T. 12 S., R. 6 W.	35	Lot 3	.20	OT
T. 12 S., R. 8 W.	6	Lot 7	40.18	PD
T. 12 S., R. 8 W.	7	Lots 1, 2	79.04	PD
T. 12 S., R. 9 W.	29	ENE, SESE	120.00	PD
T. 12 S., R. 9 W.	32	ENE, SWNE	120.00	PD
T. 12 S., R. 9 W.	34	NENW	40.00	PD
T. 12 S., R. 9 W.	35	NENW, SSW	120.00	PD
T. 12 S., R. 10 W.	6	SWSE	40.00	PD
T. 12 S., R. 10 W.	14	NENE	40.00	PD
T. 12 S., R. 10 W.	25	SW, SE	320.00	PD
T. 12 S., R. 10 W.	35	NESE	320.00	PD
T. 12 S., R. 11 W	9	Lots 5-8, SWNW	201.76	PD
T. 12 S., R. 11 W.	10	Lots 3, 4	76.16	PD
T. 12 S., R. 11 W.	17	Lot 5	38.84	PD
T. 13 S., R. 3 E.	9	NENE	40.00	PD
T. 13 S., R. 3 E.	24	NNE, SENE	120.00	PD
T. 13 S., R. 2 W.	21	NWNE	40.00	OC
T. 13 S., R. 4 W.	30	Lot 5	8.49	PD
T. 13 S., R. 5 W.	29	Lot 1	.84	OC
T. 13 S., R. 9 W.	5	SW	160.00	PD
T. 13 S., R. 9 W.	10	ENE, NESE	120.00	PD
T. 13 S., R. 9 W.	13	NWNW	40.00	PD
T. 13 S., R. 9 W.	20	SSW, SWSE	120.00	PD
T. 13 S., R. 11 W.	3	SWSE	40.00	PD
T. 13 S., R. 11 W.	22	Lots 19, 20	78.23	PD

Township	Section	Subdivision	Acres	Status
T. 13 S., R. 11 W.	23	Lot 3	39.15	PD
T. 13 S., R. 11 W.	26	ESE	80.00	PD
T. 13 S., R. 11 W.	28	Lot 9	7.60	PD
T. 13 S., R. 11 W.	33	NESE	40.00	PD
T. 14 S., R. 5 W.	25	Lot 1	.26	OC
T. 14 S., R. 11 W.	3	Lots 1, 2, 25	111.50	PD
T. 14 S., R. 11 W.	4	Lots 29, 30	84.30	PD
T. 14 S., R. 11 W.	5	Lot 10	40.62	PD
T. 14 S., R. 11 W.	6	Lot 16	40.00	PD
T. 14 S., R. 11 W.	10	Lots 1, 11-13, 17	210.21	PD
T. 14 S., R. 11 W.	15	NESE	40.00	PD
T. 14 S., R. 12 W.	35	SENE	40.00	PD
T. 15 S., R. 5 W.	6	Lot 5	1.46	PD
T. 15 S., R. 9 W.	1	Lot 3, SENW, NESE	20.94	OC

PD=Public Domain Land OC=O&C Revested Railroad Land OT=Other

NOTE: Some tracts in zone 3 are not available for disposal due to the presence of special resource values. They are not included in this list.

Source: WODDB and district realty records

Appendix 2-I Proposed Restrictions on Mineral and Energy Exploration and Development Activity

Introduction

This appendix discusses the leasing stipulations which would be applied to BLM-administered lands as appropriate under each alternative. Operating standards pertinent to the locatable and salable minerals program are also described. Mineral exploration and development on federal lands must also comply with laws and regulations administered by several agencies of the state of Oregon. These state requirements are not discussed in this document.

Leasable Mineral Resources

Oil and Gas Leasing

The Mineral Leasing Act of 1920 (as amended) provides that all publicly owned oil and gas resources be open to leasing unless a specific land order has been issued to close the area. Through the land use planning process, the availability of these resources for leasing is analyzed, taking into consideration development potential and surface resources. Constraints on oil and gas operations are identified and placed in the leases as notices and stipulations. Oil and gas leases are then issued from the BLM Oregon State Office in Portland. Specific proposed notices and stipulations are listed by alternative in a subsequent section of this appendix.

The issuance of a lease conveys to the lessee an authorization to actively explore and/or develop the lease. This must be done in accordance with the attached stipulations and the standard terms outlined in the Federal Onshore Oil and Gas Leasing Reform Act, as amended (FOOGLRA). Restrictions on oil and gas activities in the planning area would take the form of timing limitations, controlled surface use, or no surface occupancy stipulations. These would be used at the discretion of the BLM authorized officer (AO) to protect identified surface resources of special concern.

Stipulations would be attached to each lease, before it is offered for sale, by the office which reviews the lease tract. The review would be conducted by consulting the direction given in this resource management plan. In addition, all lands administered by the BLM within the planning area would be subject to the lease notices as shown on the following pages. Every attempt would be made to place stipulations in the lease and to minimize use of Standard Conditions of Approval attached to the site-specific permit. All federal lessees or operators are required to follow procedures set forth by Onshore Oil and Gas Orders, notice to lease (NTL), FOOGLRA, and title 43 Code of Federal Regulations, part 3100.

Oil and Gas Operations

Geophysical Explorations

Geophysical operations may be conducted regardless of whether or not the land is leased. Notices to conduct geophysical operations on BLM surface are received by a resource area. Administration and surface protection are accomplished through close cooperation of the operator and the BLM. Seasonal restrictions may be imposed to reduce fire hazards, conflicts with wildlife, watershed damage, etc. An operator is required to file a Notice of Intent to Conduct Oil and Gas Exploration Operations for all geophysical activities on public land administered by the BLM. The notice should adequately show the location and access routes, anticipated surface damages, and time frame. The operator must be bonded, and required to comply with written instructions and orders given by the AO. Signing of a notice of intent by the operator signifies agreement to comply with the terms and conditions of the notice, regulations, and other requirements prescribed by the AO. A prework conference and/or site inspection may be required. Periodic checks during and upon completion of the operations would be conducted to ensure compliance with the terms of notice of intent, including reclamation.

Drilling Permit Process

The federal lessee or operating company selects a drill site based on spacing requirements, subsurface and surface geology, geophysics, topography, and economic considerations. Well spacing is determined by the AO after considering topography, reservoir characteristics, protection of correlative rights, potential for well interference, interference with multiple use of lands, and protection of the surface and subsurface environments. Close coordination with the state would take place. Written field spacing orders are issued for each field. Exceptions to spacing requirements involving federal lands may be granted after joint state and BLM review.

Notice of Staking

Once the company makes the decision to drill, they must decide whether to submit a notice of staking (NOS) or apply directly for a permit to drill. The NOS is an outline of what the company intends to do. It

includes a location map and sketched site plan. The NOS is used to review any conflicts with known critical resource values and to identify the need for associated rights-of-way and special use permits. The BLM utilizes information contained in the NOS and obtained from the onsite inspection to develop stipulations to be incorporated into the application for permit to drill. Upon receipt of the NOS, the BLM posts the document and pertinent information about the proposed well in the district office for a minimum of 30 days prior to approval, for review and comment by the public.

Application for Permit to Drill (APD)

The operator may or may not choose to submit a NOS. In either case, an APD must be submitted prior to drilling. An APD consists of two main parts. (1) A 12-point surface plan which describes any surface disturbances. This is reviewed by resource specialists for adequacy with regard to lease stipulations designed to mitigate impacts to identified resource conflicts with the specific proposal. (2) An 8-point subsurface plan which details the drilling program. It is reviewed by the staff petroleum engineer and geologist. This plan includes provisions for casing, cementing, well control, and other safety requirements. For the APD option, the onsite inspection is used to assess possible impact and develop stipulations to minimize these impacts. If the NOS option is not utilized, the 30-day posting period begins with the filing of the APD. Private surface owner input is actively solicited during the APD stage.

Less restrictive stipulations were considered during the planning process, but were found inadequate to protect known or suspected special values.

Notices would be issued with each lease for all lands administered by the BLM within the planning area. Lease notices are attached to leases in the same manner as stipulations. However, there is an important distinction between lease notices and stipulations. Lease notices do not involve new restrictions or requirements. Any requirements contained in a lease notice must be fully supported in laws, regulations, policy, or onshore oil and gas orders.

Each stipulation may include waivers, exceptions, and modifications, defined as follows:

Waiver. The lifting of a stipulation from a lease which constitutes a permanent revocation of the stipulation from that time forward. This is usually a substantial change and requires a 30-day posting of the action for public involvement before the permitting activity associated with the process can be approved.

Exception. A one time lifting of a stipulation to allow a permitting activity for a specific proposal. It has no permanent effect on the lease stipulation and would not constitute a substantial change to the stipulation and requires no posting.

Modification. A change to a stipulation which temporarily suspends the stipulation requirement or permanently lifts the application of the stipulation on a given portion of the lease. It may or may not require posting based on whether or not the change is determined to be substantial by the AO.

Leasing Stipulations

Standard Leasing Stipulations:

Standard stipulations for oil and gas are listed in section 6, form 3100-11, Offer to Lease and Lease for Oil and Gas. They are:

Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air and water, to cultural, biological, visual and other resources, and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-way. Such uses shall be conditioned to prevent unnecessary or unreasonable interference with rights of the lessee.

Common to All Alternatives

Prior to disturbing the surface of the leased lands, lessee shall contact the BLM to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short-term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact

Leasing Stipulation Summary

Leasing stipulations by alternative are summarized in the following table and described in the narrative following the table.

	NA	A	B	C	D	E	PA
Open - Standard Stipulations	x	x	x	x	x	x	x
Open - Powersite Stipulation	x	x	x	x	x	x	x
Open - No Surface Occupancy (NSO)							
recreation sites	x	x	x	x	x	x	x
R&PP and FLPMA Leases	x	x	x	x	x	x	x
forest disease research and and study sites		x	x	x	x	x	x
special areas		x	x	x	x	x	x
progeny test sites		x	x	x	x	x	x
Horning Seed Orchard		x	x	x	x	x	x
VRM class I		x	x	x	x	x	x
T&E plant or animal habitat	x	x	x	x	x	x	x
designated wild and scenic rivers	x	x	x	x	x	x	x
suitable wild or scenic rivers				x	x	x	
riparian management areas		x	x	x	x	x	x
great blue heron nest sites				x	x	x	x
osprey nest sites				x	x	x	x
seral stage diversity blocks			x				
restoration and retention blocks				x			
basal area retention blocks				x			
designated conservation areas for the northern spotted owl					x		
protected wildlife and plant habitat						x	
old-growth emphasis areas							x
connectivity areas							x
Open - Additional Requirements - Controlled Surface Use (CSU)							
steep slopes (60% +)		x	x	x	x	x	x
VRM class II	x	x	x	x	x	x	x
special recreation management areas			x	x	x	x	x
specified municipal watersheds			x	x	x	x	x
managed rural interface areas			x	x	x	x	x
suitable recreational rivers			x	x	x	x	x
other special status species	x	x	x	x	x	x	x
Open - Additional Requirements - Timing Limitations							
raptor nests				x	x	x	x
Open - Additional Requirements - Notice							
T&E plant or animal habitat	x	x	x	x	x	x	x
Other special status species habitat	x	x	x	x	x	x	x
cultural resources	x	x	x	x	x	x	x

lessor. Lessee shall cease any operations that would result in the destruction of such species or objects until appropriate steps have been taken to protect the site or recover the resources as determined by the BLM in consultation with other appropriate agencies.

Powersite stipulation (form No. 3730-1): to be used on all lands within powersite reservations.

No Surface Occupancy Stipulations:

Resource: designated wild and scenic rivers (WSR).

Stipulation: surface occupancy and use is prohibited within ______ WSR corridor.

Objective: to protect outstandingly remarkable values (ORVs).

Resource: T/E plant or animal habitat (federally listed or proposed for listing)

Stipulation: surface occupancy and use is prohibited within ___ (distance) of ______ habitat site.

Objective: to protect T/E plant or animal habitat sites in accordance with the Endangered Species Act (ESA).

Resource: recreation sites

Stipulation: surface occupancy and use is prohibited within ______ recreation site.

Objective: to protect developed recreation sites and visitor experiences.

Resource: R&PP and FLPMA Leases

Stipulation: surface occupancy and use is prohibited on _______ Recreation and Public Purposes (R&PP) (or FLPMA) lease.

Objective: to protect public uses on existing R&PP or FLPMA leases and the investments of leaseholders.

Resource: forest disease research and study sites

Stipulation: surface occupancy and use is prohibited within ______ forest disease research or study site.

Objective: to protect BLM investments in research or study sites.

Resource: special areas

Stipulation: surface occupancy and use is prohibited within _______ special area.

Objective: to protect important historic, cultural, scenic values, natural resources, natural systems or processes, T/E plant species, and/or natural hazard areas of the special areas.

Resource: progeny test sites

Stipulation: surface occupancy and use is prohibited within _______ progeny test site.

Objective: to protect BLM investments in progeny test sites.

Resource: Horning Seed Orchard

Stipulation: surface occupancy and use is prohibited within the Horning Seed Orchard.

Objective: to protect the BLM investment in the Horning Seed Orchard.

Resource: visual resource management (VRM) Class I

Stipulation: surface occupancy and use is prohibited in VRM class I areas.

Objective: to preserve the existing character of the landscape.

Resource: riparian management areas (RMAs)

Stipulation: surface occupancy and use is prohibited within RMAs.

Objective: to protect water quality and riparian vegetation.

Resource: great blue heron rookery

Stipulation: surface occupancy and use is prohibited within the ________ great blue heron rookery.

Objective: to protect known great blue heron rookeries.

Resource: osprey nest sites

Stipulation: surface occupancy and use is prohibited within ____ (distance) of the ______ osprey nest site.

Objective: to protect osprey nest sites which have been active within the past seven years.

Resource: suitable wild and/or scenic rivers

Stipulation: surface occupancy and use is prohibited within the ______ river corridor which is found suitable for wild and/or scenic designation.

Objective: to protect outstandingly remarkable values (ORVs).

Resource: alternative B seral stage diversity blocks

Stipulation: surface occupancy and use is prohibited within seral stage diversity blocks.

Objective: to maintain natural diversity, including minimal disturbance of animal populations.

Resource: alternative C restoration and retention blocks

Stipulation: surface occupancy and use is prohibited within restoration and retention blocks.

Objective: to maintain biological diversity, including minimal disturbance of animal populations.

Resource: alternative C basal area retention blocks

Stipulation: surface occupancy and use is prohibited within restoration and retention blocks.

Objective: to maintain biological diversity.

Resource: alternative D designated conservation areas (DCAs) for the northern spotted owl.

Stipulation: surface occupancy and use is prohibited within DCAs.

Objective: to maintain spotted owl habitat.

Resource: alternative E protected wildlife and plant habitat - forest stands over 150 years old, suitable habitat within two miles of spotted owl sites and 40-acre blocks in headwaters

Stipulation: surface occupancy and use is prohibited within protected habitat.

Objective: to maintain protected habitat.

Resource: preferred alternative old-growth emphasis areas (OGEAs)

Stipulation: surface occupancy and use is prohibited within OGEAs.

Objective: to maintain old-growth forest habitat and minimize disturbance of wildlife populations.

Resource: preferred alternative connectivity areas (CAs)

Stipulation: surface occupancy and use is prohibited within CAs.

Objective: to maintain older forest habitat and reduce disturbance of wildlife populations.

Controlled Surface Use Stipulations:

Resource: other special status species

Stipulation: unless otherwise authorized, drill site construction and access through habitat of (name), a (federal candidate, state listed or bureau sensitive) species, within this leasehold will be limited to designated roadways.

Objective: to protect other special status species habitat.

Resource: visual resource management (VRM) Class II

Stipulation: all surface-disturbing activities, semipermanent and permanent facilities in VRM class II areas may require special design including location, painting and camouflage to blend with the natural surroundings and meet the visual quality objectives for the area.

Objective: to control the visual impacts of activities and facilities within acceptable levels.

Resource: steep slopes

Stipulation: prior to disturbance of slopes over 60 percent, an engineering/reclamation plan must be approved by the AO. Such plan must demonstrate how the following would be accomplished:

- Restoration of site productivity.
- Control of surface runoff.
- Protection of offsite areas from accelerated erosion, such as rilling, gullying, piping, and mass wasting.
- Conformance with state and federal water quality laws.

Objective: to maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes and to avoid areas subject to slope failure, mass wasting, piping, or having excessive reclamation problems.

Resource: special recreation management areas (SRMAs)

Stipulation: unless otherwise authorized, drill site construction and access through ______ (name) SRMA within this leasehold will be limited to designated roadways. All surface-disturbing activities, semipermanent and permanent facilities may require special design including location, painting and camouflage to blend with the natural surroundings and meet the visual quality objectives for the area.

Objective: to protect recreational qualities of the lands involved and recreational facilities and enhance recreational opportunities within the designated boundaries of SRMAs.

Resource: Suitable Recreational Rivers

Stipulation: unless otherwise authorized, drill site construction and access through _______ (name) suitable recreational river corridor within this leasehold will be limited to designated roadways. All surface-disturbing activities, semipermanent and permanent facilities may require special design including location, painting and camouflage to blend with the natural surroundings and meet the visual quality objectives for the area.

Objective: to protect outstandingly remarkable values within the boundaries of rivers found suitable for recreational designation.

Resource: managed rural interface areas (MRIAs)

Stipulation: unless otherwise authorized, drill site construction and access through the MRIA in (legal description) within this leasehold will be limited to designated roadways.

Objective: to minimize conflicts with people living in rural development areas adjacent to BLM-administered lands.

Resource: specified municipal watersheds

Stipulation: unless otherwise authorized, drill site construction and access through _______ (name) municipal watershed within this leasehold will be limited to designated roadways.

Objective: to protect water quality.

Notices:

Threatened or Endangered Plant or Animal Habitat

The leased lands are in an area with habitat suitable for (common name/scientific name), an ___ species which is officially (listed/proposed for listing) as a(n) (threatened/endangered) species.

All suitable habitat will be identified for the lessee/operator by the AO of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then (consultation/conferencing) will be conducted with the USFWS pursuant to sec. 7 of the Endangered Species Act of 1973, as amended. The (consultation/conference) will determine whether or not the proposed activity would jeopardize the continued existence of the species, and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973.

Other Special Status Plant and Animal Habitat

The leased lands are in an area with suitable habitat for (common name/scientific name), a ___ species which is a (federal candidate, state-listed or bureau sensitive) species.

All suitable habitat will be identified for the lessee/operator by the AO of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then BLM policy directs that technical assistance be obtained from the USFWS to insure that actions will not increase the need to list the species as threatened or endangered species.

Authority: The Endangered Species Act of 1973.

Cultural Resources

An inventory of the leased lands may be required prior to surface disturbance to determine if cultural resources are present and to identify needed mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator shall:

1. Contact the surface management agency (SMA) to determine if a cultural resource inventory is required. If an inventory is required, then;

2. The SMA will complete the required inventory; or the lessee or operator, at their option, may engage the services of a cultural resource consultant acceptable to the SMA to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the standard ten- acre minimum to cover possible site reloca-

tion which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the SMA for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface-disturbing operation is submitted.

3. Implement mitigation measures required by the SMA. Mitigation may include the relocation of proposed lease-related activities or other protective measures such as data recovery and extensive recordation. Where impacts to cultural resources cannot be mitigated to the satisfaction of the SMA, surface occupancy on that area must be prohibited. The lessee or operator shall immediately bring to the attention of the SMA any cultural resources discovered as a result of approved operations under this lease, and shall not disturb such discoveries until directed to proceed by the SMA.

Authorities: Compliance with section 106 of the National Historic Preservation Act is required for all actions which may affect cultural properties eligible to the National Register of Historic Places. Section 6 of the Oil and Gas Lease Terms (form 3100-11) requires that operations be conducted in a manner that minimizes adverse impacts to cultural and other resources.

Timing Limitations:

Resource: raptor nests

Stipulation: surface use is prohibited from (dates), within ___ (distance) of raptor nest sites which have been active within the past two years. This stipulation does not apply to the operation and maintenance of production facilities.

Objective: to protect nest sites of raptors which have been identified as species of special concern in Oregon.

Locatable Minerals Surface Management

The following operational guidelines would apply to all mining operations, including causal use, on BLM-administered lands in the district. The manner in which the necessary work is to be done will be site specific. All of the following standards may not apply to each mining operation. The mining claimant's and operator's responsibilities are to avoid unnecessary or undue degradation, and they must perform all necessary reclamation work. General requirements are described in 43 CFR part 3809. The BLM would provide additional site-specific guidelines for some mining proposals.

Construction and Mining

Vegetation Removal

Only vegetation which is in the way of mining activities may be removed. Merchantable timber must be marked by BLM prior to cutting, and may not be used for firewood. Small trees (less than 6 inches dbh) and shrubs will be lopped and scattered, or shredded for use as mulch. Trees over 12 inches dbh are to be bucked to lengths determined by the AO and stacked in an accessible location unless they are needed for the mining operation.

Firewood

Firewood permits may be issued to the operator from designated firewood areas.

Topsoil

Productive topsoil (usually the top 12-18 inches) in excavations would be stripped, stockpiled and protected from erosion for use in future reclamation. This also includes removal of topsoil before the establishment of mining waste dumps and tailings ponds if the waste material will be left in place during reclamation.

Roads

Existing roads and trails should be used where possible. Temporary roads are to be constructed to a minimum width and with minimum cuts and fills. All roads shall be constructed so as not to negatively impact slope stability.

Water Quality

When mining will be in or near bodies of water or sediment will be discharged, DEQ will be contacted. The operator's responsibility is to obtain any needed suction dredging, stream bed alteration, or water discharge permits required by the DEQ or other state agencies. Copies of such permits shall be provided to the AO if a notice or plan of operations is filed.

Claim Monuments

Due to a new state law, plastic pipe is no longer allowed for claim staking in Oregon. Mining claims with existing plastic pipe monuments should have all openings permanently closed. Upon loss or abandonment of the claim, all plastic pipe must be removed from the public lands. When old markers are replaced during normal claim maintenance, they are to be wood posts or stone or earth mounds, consistent with state law.

Drill Sites

Exploratory drill sites should be located next to or on existing roads when possible without blocking public access. When drill sites must be constructed, the size of the disturbance shall be as small as possible in order to conduct drilling operations.

Dust and Erosion Control

While in operation and during periods of temporary shut down, exposed ground surfaces susceptible to erosion will need to be protected. This can be accomplished with seeding, mulching, installation of water diversions, and routine watering of dust producing surfaces.

Fire Safety

All state fire regulations must be followed, including obtaining a campfire permit or blasting permit if needed. All internal combustion engines must be equipped with approved spark arresters.

Safety and Public Exclusion

The general public may not be excluded from the mining claim. In the interest of safety, the general public can be restricted only from specific dangerous areas (underground mines, open pits or heavy equipment) by erecting fences, gates and warning signs. It is the operator's responsibility to protect the public from mining hazards. Gates or road blocks may be installed on existing or proposed roads only with BLM approval.

Sewage

Self-contained or chemical toilets are to be used at active mining operations and their contents disposed of at approved dump stations. Outhouses and uncontained pit toilets are not allowed.

Occupancy

Occupancy or camping on public land, in excess of 14 days per calendar year, must be reasonably incident to and required for actual continuous mining or diligent exploration operations and will require either a notice or plan of operations.

Only those persons actively involved in the mining operation or exploration work will be allowed to stay on the claim beyond the 14 day camping limit. Active operations are defined as a 40-hour work week (between 9 a.m. and 5 p.m., Monday-Friday). If operations can not be actively pursued due to high fire danger in forested areas, then occupancy of the mine site will not be permitted.

Due to high water levels in streams and creeks during the fall and winter months, placer mining with hand tools and suction dredges historically has been too sporadic to warrant full time occupancy at mine sites. Therefore, mining claim occupancy for such operations is only permitted between May 15 to November 15. Other out of stream mining ventures may warrant occupancy beyond November 15, and will be evaluated on a case by case basis.

Structures

Structures will not be allowed for exploratory operations or for suction dredge mining operations. For other types of commercial operations, the need for structures will be evaluated on a case by case basis. If they are found necessary for the mining operation, they should be temporary in nature.

Pets

If the operator proposes to have dogs or other pets at the site, all animals must be leashed. Under no circumstances are pets to be allowed to run free at mining sites or associated camp sites.

Suction Dredging

Filing either notice or plan of operations is required on all suction dredge operations. The operator must have the applicable DEQ suction dredge permit prior to starting work, and a copy should be submitted to the AO.

Tailings Ponds

Settling ponds must be used to contain fines and any discharge into creeks must meet the DEQ standards.

Gates

Gates restricting public access onto a mine site will only be considered where there is a large area safety hazard created by the mining activity. Fences (rather than gates) shall be utilized to protect the public from hazards related to small excavations, tunnels, and shafts.

Trash and Garbage

Trash, garbage, used oil, etc., must be removed from public land and disposed of at a designated landfill. Trash, garbage or hazardous wastes must not be buried on public lands. Accumulation of trash, debris, or inoperable equipment on public lands is viewed as unnecessary degradation and will not be tolerated.

Reclamation

Reclamation of all disturbed areas must be performed to the standards described in 3809-1-3(d) as soon as possible after mining permanently ceases. Reclamation may be postponed during two years of nonoperation (when mining in the area stops), if future mining is scheduled to resume within two years. Minimal assessment work is considered nonoperation. Erosion must be prevented during periods of nonoperation and may require road maintenance, seeding, mulching or other preventative efforts as deemed necessary by the BLM.

Equipment and Debris

All mining equipment, vehicles, structures, debris and trash must be removed from the public lands during periods of nonoperation and/or at the conclusion of mining, unless authorization from BLM is given to the operator or claimant in writing.

Backfilling and Recontouring

The first steps in reclaiming a disturbed site are backfilling excavations and reducing high walls. Coarse rock material should be replaced first, followed by medium sized material, with fine materials to be placed on top. Recontouring means shaping the disturbed area so that it will blend in with the surrounding lands and minimize the possibility of erosion.

Seed Bed Preparation

Recontouring should include preparation of an adequate seedbed. This is accomplished by ripping or disking compacted soils to a depth of at least six inches in rocky areas and at least 12 inches in less rocky areas. This should be done following the contour of the land to limit erosion. All stockpiled settling pond fines, and then topsoil, are spread evenly over the disturbed areas.

Fertilizer

Due to the poor nutrient value of mined soils, it is important to use a good fertilizer to insure maximum yield from the seeding mixture. The fertilizer (16-16-16) should be spread at the rate of 200 pounds per acre but not allowed to enter streams or bodies of water.

Seeding

BLM approved seeding prescription must be used to provide adequate revegetation for erosion control, wildlife habitat, and productive secondary uses of public lands. Seeding must be done in September or October to ensure that seed is in the ground prior to the first significant winter rains.

Broadcast seeding is preferable on smaller sites. When using a whirlybird type seed spreader, it is important to keep the different seeds well mixed to achieve even seed distribution. For the best results, a drag harrow should be pulled over the seeded area to cover the seed before mulching. Hydroseeding can be used on critical sites for rapid cover and erosion control on cut banks, fill slopes and any other disturbed areas.

Tree Replacement

Replacement of destroyed trees may be necessary with the planting of seedlings or container stock.

Mulch

As directed by the BLM, during review of the notice or plan of operations, the disturbed area may require mulching during interim or final reclamation procedures. Depending on site conditions, the mulch may need to be punched, netted, or blown on with a tackifier to hold it in place. In some cases, erosion control blankets may be required.

Roads

After mining is completed, all new roads shall be reclaimed, unless otherwise specified by the BLM. High wall and cutbanks are to be knocked down or backfilled to blend with the surrounding landscape. Remove all culverts from drainage crossings and cut back the fill to the original channel. The roadbed should be ripped to a minimum depth of 12 inches to reduce compaction and provide a good seedbed. The road must then be fertilized, seeded and mulched if necessary. When necessary, waterbars are to be used to block access and provide drainage.

Tailings Ponds

The ponds should be allowed to dry out and the fines removed and spread with the topsoil, unless the fines contain toxic materials. If the ponds contain toxic materials, a plan will be developed to identify, dispose, and mitigate effects of the toxic materials. If necessary, a monitoring plan will also be implemented. The ponds should then be backfilled and reclaimed.

Salable Mineral Resources

Proposed Operations

All proposed salable mineral developments and any exploration that involves surface disturbance would have operation and reclamation plans. They would undergo an appropriate level of review and compliance with NEPA.

Quarry Design

Due to steep terrain in the operating area, most quarry developments will require a series of benches to effectively maximize the amount of mineral materials to be removed in a safe manner. In most cases, bench height should not exceed 40 feet. If the bench will be used by bulldozers to access other parts of the quarry, the width of the bench should be at least 25 feet. If the bench is not used by equipment, then this width can be reduced to approximately 10 feet.

Clearing of timber and brush should be planned at least 10 feet beyond the edge of the excavation limit. Most often the brush will be piled and burned at the site, or scattered nearby.

If possible, all topsoil and overburden should be stockpiled and saved for eventual quarry site reclamation. These piles may need to be stabilized by mulching or seeding in order to minimize erosion during the winter months.

As a standard procedure, the excavation of the quarry floor should be designed with an outslope of approximately two percent to provide for adequate drainage of the floor. Compliance with this design should be made a requirement of all operators at the site.

Operating Procedures

The following requirements should be made a part of every contract or permit providing for the use of mineral material sites on the district:

Oversized boulders shall not be wasted but shall be broken and utilized concurrently with the excavated material.

The operator shall comply with local and state safety codes covering quarry operations, warning signs and traffic control. All necessary permits must be obtained from state and county agencies.

Use of the site for equipment storage and stockpiling rock material is allowed for the duration of the contract or permit. Use of the site beyond that time would be authorized under a special use permit.

Appendix 2-J Timber Harvest and Management Details, Preferred Alternative

Preferred Alternative Harvest by Sustained Yield Unit
(MMCF / Decade and MMBF / Decade)

	Decade									
	1st		2nd		3rd		5th		10th	
SYU	MMCF	MMBF	MMCF	MMBF	MMCF	MMBF	MMCF	MMBF	MMCF	MMBF
Clackamas – Molalla	40.5	245.6	40.5	245.0	40.5	241.6	40.5	239.1	40.5	247.5
Santiam	48.8	311.0	48.8	307.2	48.8	294.4	48.8	290.9	48.8	303.9
Columbia	71.9	462.3	71.9	444.2	71.9	446.5	71.9	444.7	71.9	463.8
Alsea–Rickreall	54.1	345.6	54.1	332.5	54.1	329.5	54.1	328.4	54.1	347.9
Salem District	215.3	1364.5	215.3	1328.9	215.3	1312.0	215.3	1303.1	215.3	1363.1

Preferred Alt. Assumed Stand Treatments by Decade (acres) Salem District

	Decade				
Treatment	1st	2nd	3rd	5th	10th
Plant Genet. Selected Stock	17,262	17,695	20,028	14,519	13,375
Competing Veg. Control	16.519	12,048	13,039	9,061	9,144
Precommercial Thin (PCT)	15,678	12,166	13,724	9,950	9,213
Fertilization	14,632	16,932	15,940	29,053	33,375

Expected Preferred Alternative Harvest by Sustained Yield Unit (Acres and MMCF / decade.)

Clackamas-Molalla SYU	1st Decade Acres	1st Decade Volume (MMCF)	2nd Decade Acres	2nd Decade Volume (MMCF)	3rd Decade Acres	3rd Decade Volume (MMCF)	5th Decade Acres	5th Decade Volume (MMCF)	10th Decade Acres	10th Decade Volume (MMCF)
Old Growth Emphasis Areas										
Regeneration Harvest	0	0.00	0	0.00	0	0.00	0	0.00	1,824	29.69
Density Management	34	0.03	37	0.03	70	0.06	1,322	1.40	0	0.00
Connectivity Areas										
Regeneration Harvest	79	0.99	185	2.34	31	0.23	517	7.04	0	0.00
Density Management	190	0.21	243	0.33	223	0.28	303	0.37	87	0.11
General Forest Management Areas										
Regeneration Harvest	3,646	38.73	3,458	37.22	4,230	39.77	2,531	29.16	539	6.55
Commercial Thinning	488	0.54	561	0.58	113	0.16	1,625	2.53	2,595	4.15
SYU Subtotals										
Regeneration Harvest	3,725	39.72	3,643	39.56	4,261	40.00	3,048	36.20	2,363	36.24
Density / Thinning	712	0.78	841	0.94	406	0.50	3,250	4.30	2,682	4.26
All Harvest	4,437	40.50	4,484	40.50	4,667	40.50	6,298	40.50	5,045	40.50
Santiam SYU										
Old Growth Emphasis Areas (OGEA-1 and OGEA-3)										
Regeneration Harvest (OGE	602	7.41	1,080	13.05	602	7.58	0	0.00	1,456	17.11
Density Management	50	0.13	771	2.50	1,788	2.66	3,031	4.61	1,062	2.55
Connectivity Areas										
Regeneration Harvest	870	10.47	1,127	13.27	398	1.83	366	3.12	487	5.16
Density Management	467	1.18	684	1.35	585	1.05	987	2.22	965	2.14
General Forest Management Areas										
Regeneration Harvest	2,667	28.58	1,879	17.63	4,847	35.12	3,452	37.05	1,188	18.83
Commercial Thinning	713	1.03	739	1.00	301	0.56	973	1.80	1,705	3.01
SYU Subtotals										
Regeneration Harvest	4,139	46.46	4,086	43.95	5,847	44.53	3,818	40.17	3,131	41.10
Density / Thinning	1,230	2.34	2,194	4.85	2,674	4.27	4,991	8.63	3,732	7.70
All Harvest	5,369	48.80	6,280	48.80	8,521	48.80	8,809	48.80	6,863	48.80

Expected Preferred Alternative Harvest by Sustained Yield Unit (Acres and MMCF / decade.)

	1st Decade		2nd Decade		3rd Decade		5th Decade		10th Decade	
Columbia SYU	Acres	Volume (MMCF)	Acres	Volume (MMCF)	Acres	Volume (MMCF)	Acres	Volume (MMCF)	Acres	Volume (MMCF)
Old Growth Emphasis Areas (Wilson/Dorn Peak)										
Regeneration Harvest	0	0.00	0	0.00	0	0.00	0	0.00	1	0.01
Density Management	497	0.97	1,125	2.16	398	0.81	1,405	2.86	0	0.00
Old Growth Emphasis Areas (Nestucca)										
Regeneration Harvest	2,539	20.50	2,230	16.23	1,787	15.39	1,528	15.01	916	9.00
Density Management	1,471	2.75	4,630	8.16	1,068	2.23	4,758	9.14	3,250	5.84
Connectivity Areas										
Regeneration Harvest	6	0.06	0	0.00	0	0.00	0	0.00	129	1.40
Density Management	73	0.18	19	0.05	266	0.69	121	0.22	117	0.29
General Forest Management Areas										
Regeneration Harvest	8,340	46.50	4,458	43.83	5,174	52.57	3,871	41.85	3,762	48.26
Commercial Thinning	548	0.94	857	1.47	121	0.21	1,622	2.82	3,202	7.10
SYU Subtotals										
Regeneration Harvest	10,885	67.06	6,688	60.06	6,961	67.96	5,399	56.86	4,808	58.67
Density / Thinning	2,589	4.84	6,631	11.84	1,853	3.94	7,906	15.04	6,569	13.23
All Harvest	13,474	71.90	13,319	71.90	8,814	71.90	13,305	71.90	11,377	71.90
Alsea-Rickreall SYU										
Old Growth Emphasis Areas										
Regeneration Harvest	0	0.00	0	0.00	0	0.00	0	0.00	2,045	29.03
Density Management	2,218	3.20	6,659	8.84	3,643	6.29	4,606	8.35	0	0.00
Connectivity Areas										
Regeneration Harvest	2,606	21.04	2,440	28.03	1,970	21.12	173	2.45	142	2.07
Density Management	2,019	3.72	1,370	2.47	1,805	3.22	3,002	6.48	1,774	4.16
General Forest Management Areas										
Regeneration Harvest	2,239	24.70	1,570	13.13	1,820	22.42	2,077	36.14	879	15.94
Commercial Thinning	1,036	1.44	1,108	1.63	998	1.05	642	0.68	2,090	2.90
SYU Subtotals										
Regeneration Harvest	4,845	45.74	4,010	41.16	3,790	43.54	2,250	38.59	3,066	47.04
Density / Thinning	5,273	8.36	9,137	12.94	6,446	10.56	8,250	15.51	3,864	7.06
All Harvest	10,118	54.10	13,147	54.10	10,236	54.10	10,500	54.10	6,930	54.10

Expected Preferred Alternative Harvest by Sustained Yield Unit (Acres and MMCF / decade.)

	1st Decade		2nd Decade		3rd Decade		5th Decade		10th Decade	
Salem District	Acres	Volume (MMCF)	Acres	Volume (MMCF)	Acres	Volume (MMCF)	Acres	Volume (MMCF)	Acres	Volume (MMCF)
Old Growth Emphasis Areas (Except Nestucca)										
Regen. Harvest (OGEA-3 or	602	7.41	1,080	13.05	602	7.58	0	0.00	5,326	75.84
Density Management	2,799	4.33	8,592	13.53	5,899	9.82	10,364	17.22	1,062	2.55
Old Growth Emphasis Areas (Nestucca OGEA-2)										
Regeneration Harvest	2,539	20.50	2,230	16.23	1,787	15.39	1,528	15.01	916	9.00
Density Management	1,471	2.75	4,630	8.16	1,068	2.23	4,758	9.14	3,250	5.84
Connectivity Areas										
Regeneration Harvest	3,561	32.56	3,752	43.64	2,399	23.18	1,056	12.61	758	8.63
Density Management	2,749	5.29	2,316	4.20	2,879	5.24	4,413	9.29	2,943	6.70
General Forest Management Areas										
Regeneration Harvest	16,892	138.51	11,365	111.81	16,071	149.88	11,931	144.20	6,368	89.58
Commercial Thinning	2,785	3.95	3,265	4.68	1,533	1.98	4,862	7.83	9,592	17.16
Salem District Subtotals										
Regeneration Harvest	23,594	198.98	18,427	184.73	20,859	196.03	14,515	171.82	13,368	183.05
Density / Thinning	9,804	16.32	18,803	30.57	11,379	19.27	24,397	43.48	16,847	32.25
All Harvest	33,398	215.30	37,230	215.30	32,238	215.30	38,912	215.30	30,215	215.30

Salem District Preferred Alternative

Modeling Assumptions	OGA-1	OGA-2 (Nestucca)	OGA-3 (Santiam)	Connectivity Areas	General Forest Mgmt Area	VRM-2 (In General Forest)
Precommercial Thinning	Yes	Yes	Yes	Yes	Yes	Yes
Fertilization						
% of acres treated	None	None	None	None	50-100%	50-100%
Frequency	-	-	-	-	2-3 entries	2-3 entries
Commercial thin. (Partial cut):						
Objective	Density Mgt	Density Mgt	Density Mgt	Density & Tbr	Timber	Timber
% of acres--long term	Approx. 20%	Approx. 65%	Approx. 30%	Approx. 50%	Approx. 50%	Approx. 50%
Frequency (stand ages)	50-70	50/80/110	60/100	60/90	45 to 65	45 to 65
Residual stand	Average 66% crown cover	Average 66% crown cover	Average 66% crown cover	Average 66% crown cover	60-70% Basal Area	Average 66% crown cover
Regen. Harvest:						
Defer harvest until:	80 years	No Deferral	No Deferral	No Deferral	No Deferral	No Deferral
Harvest unit size	3-10 Ac	logical units (no clearcut)	Avg. 30 Ac.	10-40 Ac.	Approx 40 Ac.	3-10 Ac.
# of green trees left/ac	8	20	12	12	6	6
# Snags left/ac	Meet PNW-447	Meet PNW-447	Meet PNW-447	Existing	Existing	Existing
Dead & down material	Meet PNW-447	Meet PNW-447	Meet PNW-447	Existing	Existing	Existing
Mortality salvage (CC only)	Yes (limited)	Yes (limited)	Yes	Yes	Yes	Yes
Hardwood conversion	No	Yes	No	Yes	Yes	No
Brushfield conv. (Funded)	No	Yes	Yes	Yes	Yes	Yes
Rotation length (yrs)	300	150	200	150-200	CMAI (70-110)	150
Min. Harvest age (yrs)	80	80	80	70	70	70
Area/volume control	Area	Area	Area	Area	Volume	Area
Allowable cut effect:						
Fertilizer	No	No	No	No	Yes	Yes
Genetic gain	No	No	No	No	Yes	Yes

Sources: Trim-Plus output files; Micro*Storms

Appendix 2-K Monitoring and Research

Monitoring

Introduction

The BLM planning regulations (43 CFR 1610.4-9) call for monitoring and evaluating resource management plans at appropriate intervals. The purposes of monitoring and evaluating the RMP are to:

- Track progress of RMP implementation and assure that activities are occurring in conformance with the plan (i.e., implementation monitoring).
- Determine if activities are producing the expected results and meeting stated objectives (i.e., effectiveness monitoring).
- Determine if activities are causing the effects identified in the EIS (i.e., validation monitoring).

The implementation of the district RMP would be monitored to ensure that management actions are being implemented and meeting their intended purposes. Specific management actions arising from proposed activity plan decisions would be compared with RMP objectives to ensure consistency with the intent of the plan. However, activity plan decisions may also identify monitoring plans of their own. Such plans are addressed in this RMP monitoring plan only where RMP monitoring and activity plan monitoring overlap.

Some effectiveness monitoring and most validation can only be accomplished by formal research. RMP-related research is discussed in at the end of this appendix.

Monitoring would be conducted as specified in the following sections of this appendix. Monitoring results would be reported in an annual program summary, which would be published starting the second year following initial implementation of this RMP. The annual program summary would serve as a report to the public, track and assess the progress of plan implementation, and state the findings made through monitoring as we determine if:

- Management actions are creating satisfactory progress toward achieving RMP objectives.
- Actions are consistent with current policy.
- Original assumptions are valid and impacts are within the range predicted, given the reliability of the predictions.
- Mitigation and corrective measures are satisfactory and serving their purposes.
- The RMP is still consistent with the plans and policies of state or local government, other federal agencies, and Indian tribes.
- New data are available that could cause an alteration or amendment of the plan;

NEPA requirements are being met.
Compliance is being achieved on actions authorized by the BLM.

Each resource area is responsible for the collection, compilation and analysis of much of the data gained through monitoring activities. Resource areas would report their findings and recommendations to the district for consolidation and publication in an annual program summary.

Representative areas, such as a watershed monitoring area, may be selected and established. Intensive monitoring and data collection efforts for certain resources may be made in these areas instead of collecting general data over the entire geographic area. This can be expensive and provides less useful information. Attempts would be made to select representative areas that coincide for several resources.

All monitoring would follow written standards.

Involvement of other interested parties, including state agencies, in monitoring of plan implementation would be encouraged. This may entail coordinated monitoring efforts with parties that are able to fund their own participation in such efforts.

This monitoring plan is not static. During the life of the RMP the monitoring plan would be periodically evaluated to ascertain that the monitoring questions and standards remain relevant. It would be fine-tuned as appropriate. BLM cooperation in the U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program (still under development) may specifically lead to revision of some elements of this plan.

Air Quality

Expected Future Conditions and Outputs

Compliance with the Oregon Smoke Management Plan and the State Implementation Plan to help meet established air quality standards in accordance with the Clean Air Act.

Monitoring Questions

1. Are BLM prescribed fires contributing to intrusions into class I areas? How frequently do intrusions occur?

2. Of intrusions that the BLM is reported to be responsible for, what was the cause and what can be done to minimize future occurrences?

Standards

1. Using the Oregon Smoke Management Annual Report and any BLM smoke surveillance reports, the number of intrusions the BLM certainly or possibly contributed to would be determined annually. The percentage of total units burned that contributed (or might have) to such intrusions would be calculated.

2. Reported intrusions will be individually investigated to determine the most probable cause and establish possible corrective measures.

Costs

An estimated annual $3,000 to $5,000 districtwide.

Soil Productivity

Expected Future Conditions and Outputs

Soils would be managed to maintain long-term site productivity by avoiding or minimizing compaction/displacement, surface erosion, landslides, and loss of organic material (includes large woody debris).

Monitoring Question

Are management practices achieving the goal of maintaining long-term site productivity?

Standards

There are four components of the soil resource which would be monitored to answer the monitoring question.

1. Compaction. a) Implementation of BMPs to minimize compaction would be monitored for all surface disturbing activities. b) Effectiveness of practices to minimize compaction would be monitored for two harvest units per resource area per year. Compaction would be assessed by establishing post treatment transects (e.g. a pact transect) and determining extent of compacted areas. Results would be reported in percent of area compacted.

2. Surface Erosion. a) Implementation of BMPs to minimize surface erosion would be monitored for all surface disturbing activities. b) Effectiveness of practices to minimize surface erosion would be monitored for two harvest units per resource area per year. Information would be qualitative and obtained by visual, professional estimate immediately after harvest or site preparation and again two years later. If information indicates unacceptable erosion rates, the soil scientist/hydrologist should use a standard procedure to quantify the rate of erosion.

3. Mass Wasting (landslides). a) Implementation of BMPs to minimize landslides will be monitored for all surface disturbing activities. b) Effectiveness of practices to minimize landslides would be monitored for two harvest units per resource area per year. Monitoring would only occur if units are harvested on potential landslide sites as identified in activity plans. Information would be qualitative and obtained by visual, professional estimate immediately after harvest or site preparation and again five years later. If information indicates unacceptable erosion rates, the soil scientist/hydrologist should use a standard procedure to quantify the rate of erosion.

4. Organic Material. a) Implementation of BMPs to conserve site duff layers and organic material (including large woody debris) would be monitored for all prescribed burns. b) Effectiveness of practices to conserve site duff layers and organic material would be monitored for two harvest units per resource area per year. A method such as the pace transect would be used to assess the amount of duff and organic material remaining after burning. Sites to be considered include those that are nutrient deficient, have a high surface erosion potential, have slope gradients in excess of 70 percent, or have extremely gravelly soils.

Costs

An estimated $4,000 per resource area annually.

Water Resources

Expected Future Conditions and Outputs

Water resources would be managed to protect, maintain, or improve the quality of water resources, stream ecosystems, and watershed values. Water quality would be maintained or enhanced through design of site-specific best management practices (BMPs) in accordance with the Oregon Nonpoint Source Management Plan and the Memorandum of Agreement with Oregon Department of Environmental Quality. BMPs

would be implemented, evaluated, monitored, and adjusted as necessary to comply with basin specific water quality criteria.

Monitoring Questions

1. Are site-specific BMPs incorporated in project design and correctly applied?

2. Are applied BMPs achieving water resource objectives?

3. Are applied BMPs effective in maintaining or improving water quality consistent with basin-specific water quality criteria for protection of recognized beneficial uses?

4. Are watershed cumulative effects at or below the levels anticipated in the RMP/EIS and project-specific environmental assessments (EAs)?

5. Are objectives for the biological, chemical, and physical functions of the stream ecosystem being met?

Standards

1. All management activities utilizing BMPs would be monitored to determine whether BMPs are incorporated in the project design and correctly applied. This would be accomplished primarily through contract administration.

2. A minimum of one timber sale and one surface disturbing activity other than forest management per resource area per year would be monitored to determine whether the BMP objectives for water resources are being met.

3. Monitoring to determine effectiveness of BMPs in meeting water quality criteria would be initiated on one timber sale or other surface/riparian disturbing activity per year and would continue for approximately four years. A maximum of four activities would be monitored at any given time.

   All water bodies that are within or adjacent to an area treated with herbicides and support a beneficial use would be monitored to determine effectiveness of BMPs in meeting water quality criteria.

   Effectiveness monitoring would be designed to achieve statistical validity and would incorporate established standard monitoring methods. Selection of locations and water quality parameters for BMP effectiveness monitoring would consider beneficial use(s) likely to be affected, BMPs being applied, and water quality criteria necessary to protect beneficial use(s).

   Four small watersheds excluded from BLM initiated management activities that would adversely affect monitoring objectives would be monitored to provide baseline information on water quality and quantity. Monitoring results from these watersheds would be compared to results from managed watersheds that have similar climate, geology, soils, vegetation, etc. The baseline watersheds would allow separation of hydrologic changes due to natural climatic variability from those caused by management actions.

4. The watershed condition index used in the RMP/EIS would be recalculated for representative watersheds in the third, fifth, and seventh year of this plan to determine if cumulative effect levels are within the predicted range. Cumulative effects for small watersheds would be analyzed in each environmental assessment.

5. Four stream miles per year would be monitored before and after management activities occurred to determine whether stream ecosystem objectives are being met. This would involve intensive monitoring to identify levels of biological, chemical, and physical stream functions.

Costs

An estimated $88,000 districtwide annually, which includes 10-year amortization of $50,000 in equipment.

Biological Diversity

Expected Future Conditions and Outputs

Contribute to maintenance of diversity of plant and animal species in western Oregon. The vegetative diversity of existing managed forest stands would increase, as to species, canopy layers and dead components. Landscape level diversity on BLM-administered lands would be maintained or improved.

Monitoring Questions

What are the effects of BLM management on:

1. Acres of all seral stages?
2. Size and spatial distribution of old-growth blocks?
3. Retention of dead and down material?
4. Number of canopy layers?
5. Tree species composition in managed stands?

Monitoring for several other topics would also address elements of biological diversity, e.g., special habitats, special status species, riparian zones, retention of wildlife trees.

Standards

1. The baseline from the BLM's 1988 inventory, as updated to 1992, would be identified. Using Timber Sale Information System records and records of losses due to natural disturbance, old-growth forest reductions would be monitored at five-year intervals. Using the Operations Inventory update of approximately year 2000, acres of all seral stages would be recalculated.

2. Using the Operations Inventory update of approximately year 2000, size and spatial distribution of old growth blocks would be calculated and compared to analysis in the 1993 RMP/EIS.

3. Twenty percent of regeneration harvest and density management timber sales would be examined within a year after harvest and site preparation to determine number of dead and down logs by diameter class, length, and distribution. Through the decadal forest inventory, the trends of dead and down material would be identified on managed and unmanaged stands.

4. Acres of density management accomplished would be identified in annual work plan accomplishment reports. Through the decadal forest inventory, the number of canopy layers in established stands subject to management actions during the life of the plan would be identified.

5. First, third and fifth year stocking surveys would be used to identify tree species composition. Through the decadal forest reinventory, species composition changes in established stands subject to management actions during the life of the plan would be identified.

Costs

Item 1 costs estimated at $1,000 districtwide every five years. Item 2 costs estimated at $1,000 districtwide. Item 3 can be accomplished concurrent with similar monitoring for retention of wildlife trees, at an annual cost of $2,000 per resource area; its second part would be included in decadal forest inventory costs and difficult to separate. Item 4 would negligibly affect normal data maintenance and inventory costs. Item 5 costs estimated at $2,000 per resource area annually, in addition to traditional costs of stocking surveys.

Riparian Zones

Expected Future Conditions and Outputs

Maintenance of largely intact RMAs along each side of all perennial streams.

Maintenance or improvement of habitat conditions (i.e., numbers of green trees, snags, and downed logs) within riparian management areas that provide suitable habitat for long-term productivity of fish, wildlife, and priority plants.

Monitoring Questions

1. What is the average width of RMAs established on the ground and retained following timber harvest and site preparation activities? How does it compare to the widths anticipated in the EIS?

2. Are sufficient numbers of mature conifers, snags, and downed trees retained within riparian buffers after harvest?

3. Are RMP-approved disturbances (e.g., yarding corridors) within riparian areas no more than 25 percent of stream length with RMAs in a unit? Did the logging system achieve its objective where disturbance was allowed?

Standards

1. and 2. Twenty percent of timber sales within each resource area would be examined prior to harvest and site preparation and reexamined following harvest to determine whether buffers were retained and their average widths. Timber sale units within watersheds identified for fish habitat or water quality monitoring would be given preference. Average widths would be determined by measurement at approximately equidistant points along the affected stream reach within each sale unit. Trees, snags and downed woody material retained within buffers would be counted before and after timber harvest and site preparation according to the species and size class. Ground cover of herbs and shrubs would be measured in transects or one square meter plots.

2. In conjunction with experimental drainage established for fish habitat monitoring, one undisturbed (or essentially so) riparian study site would be established within a representative watershed established within each resource area. The study site would be used as a baseline from which to compare riparian areas impacted by timber

harvest related activities. The changes in habitat conditions would be monitored once during the expected life of the plan (or after a major land disturbance activity such as blowdown).

3. The extent of the disturbed area along the stream would be measured and compared to RMA length in the unit. The degree of disturbance would be compared to logging plan objectives.

Costs

An estimated $10,000 per resource area annually.

Retention of Wildlife Trees

Expected Future Conditions and Outputs

Maintain the following numbers of green trees and hard snags per acre within specific land allocations:

Allocated Areas	# Green Trees[1]/ac.	# Hard Snags[2]/ac.
OGEA - 1	8-10	3
OGEA - 2	15-25	3
OGEA - 3	12	3
Connectivity - 1 & 2	12	3
General Forest Management Area	6	3

[1] Green trees should have a minimum diameter of 15 inches.

[2] Hard snags should be at least 15 inches in diameter and 15 feet high. Green trees may substitute for hard snags when the latter are not available.

Monitoring Questions

Are suitable (numbers, heights and diameter classes) snags and replacement trees being left, suitably distributed, to achieve the habitat necessary to attain the 60 percent population level districtwide?

Standards

Every five years the population level of dominant woodpeckers sustainable by BLM habitat would be assessed using the analytical technique used in the RMP/EIS to assess the capability of the alternatives. In addition, 20 percent of regeneration harvest timber sales in each resource area would be examined by pre and post harvest (and after site preparation) inventories to determine snag and green tree numbers, heights, average diameters and distribution within harvest units. The measure of distribution of wildlife trees would be the percent of this material in the upper, middle and lower thirds of the sale units monitored. Wildlife trees left following timber harvest activities (including site preparation for reforestation) would be compared to those that were marked prior to harvest.

Costs

An estimated average of $6,000 per resource area annually.

Roosevelt Elk

Expected Future Conditions and Outputs

Maintain elk habitat effectiveness indices (HEs, HEr, HEc, and HEf according to Wisdom Model) on BLM-administered lands at levels equal to or exceeding 0.5 within each watershed with elk concentrations.

Monitoring Question

Are elk habitat effectiveness indices on BLM-administered lands at expected (in the RMP/EIS) levels within each or watershed with elk concentrations?

Standards

Elk habitat effectiveness indices on BLM-administered land would be calculated within selected watersheds with elk concentrations every third year using GIS.

Costs

An estimated $9,000 every three years districtwide.

Special Habitats

Expected Future Conditions and Outputs

Maintenance of undisturbed conditions in each special habitat (i.e., meadows, cliffs, etc.) plus buffers of 100-200 feet, where needed.

Monitoring Questions

Is the BLM protecting special habitats as provided in the RMP? Is the average width of undisturbed buffers retained following timber harvest and site preparation activities as specified in the RMP?

Standards

Twenty percent of BLM actions on lands containing or near special habitats within each resource area would be examined to determine whether special habitats were protected as provided in the RMP. Determine average buffer widths by measurement at approximately equidistant points around the affected special habitat within each sale unit.

Costs

An estimated $3,000 per resource area annually.

Fish Habitat

Expected Future Conditions and Outputs

Maintenance and enhancement of fish habitat with diversity and quality capable of maintaining or enhancing populations of anadromous and resident salmonoid game and priority nongame fish species.

Improvement of spawning and rearing habitat and increase of large woody debris levels.

Monitoring Questions

1. Is fish habitat in terms of quantity and quality of rearing pools and over-wintering habitat, and smolt production being maintained or improved as predicted?

2. Is large woody material being retained in the stream channel for fish habitat?

Standards

1. At least one experimental drainage per resource area would be identified to monitor long-term riparian and instream habitat and fish populations (the drainage should be at least five square miles in size, contain at least 50 percent BLM-administered land). Monitoring would include riparian and instream habitat inventories of all streams used by salmon and/or trout. Outmigrating fish population estimates would be determined for the basin. Index areas would be established for adult spawning escapement. Habitat and summer fish surveys should be conducted using a microhabitat system that is similar to or currently being used by western Oregon Districts (Monitoring Western Oregon Records of Decision H-1734-1, 1986). This is comparable to ODFW research and Hankin and Reeves methodologies. Adult spawning ground counts would be conducted annually to procedures similar to ODFW index streams.

2. All streams supporting salmonoids would be sampled once every ten years for changes in riparian and instream habitat conditions.

Costs

An estimated $13,000 per resource area annually, plus initial costs for equipment of $3,000.

Special Status Species

Expected Future Conditions and Outputs

Conservation or recovery of special status species and their habitats so that listing under the Endangered Species Act (ESA) is not needed.

Monitoring Questions

1. Are BLM actions and BLM authorized actions designed and executed to protect or enhance special status species and/or their habitat to the extent required by the ESA, bureau policy, or directed in the RMP?

2. Are the mitigation and protection measures employed effective?

Standards

1. Annually 20 percent of the files on each year's timber sales and other relevant actions (e.g., rights-of-way, instream structures) would be reviewed to evaluate documentation regarding special status species and related recommendations and decisions in light of ESA requirements, policy and RMP decisions. If mitigation was required, review would ascertain whether such mitigation was incorporated in the authorization document. The relevant actions would be reviewed on the ground after completion to ascertain whether the mitigation was carried out as planned.

2a. Habitat conditions would be monitored at all or a representative sampling of known sites of all listed, proposed, candidate, state-listed, and bureau sensitive plant and animal species identified as occupying sites potentially affected by bureau actions. This would occur before and within a year after site disturbance and/or at intervals of at least five years. Population trends of plants in those categories at such sites would also be monitored. Such monitoring would particularly evaluate effectiveness of mitigating measures.

2b. Northern spotted owl monitoring would focus on population characteristics on BLM-administered lands throughout the range and on habitat condition and trend relative to BLM's management strategy.

Population monitoring would be an adaptation of ongoing BLM efforts which would conform to recommendations in the final recovery plan, after it is adopted. The draft recovery plan released by the Fish and Wildlife Service recommended that monitoring should involve five initiatives under a comprehensive program. These are as follows:

- Roadside survey of territorial birds. Survey would provide census or index data on territorial owls relative to a spectrum of habitat abundance strata.
- Owl activity site monitoring. Specific surveys of known sites would provide information on occupancy, reproduction, turnover rates, and survival.
- Transmitter studies of dispersing juveniles, and territorial and nonterritorial adults. The use of radiotelemetry systems would provide specific information on movements of dispersing juveniles and the habits of nonterritorial birds in relation to the territorial population.
- Other related studies. Additional work beyond that already described would explore elements such as age ratios of first time breeders and the further development of landscape level computer models.
- Coordination and integration of the above initiatives. A specific effort would organize and interpret results from all aspects of the monitoring program. It would assemble information in a form to permit evaluation of management and modification of the recovery plan, if necessary. It would also provide data to support delisting, when appropriate.

Habitat monitoring would determine whether the BLM's land allocations and prescriptions are implemented as planned. Additional efforts would track whether habitat condition and trend patterns track those predicted and meet the expectations of the prescriptions employed to provide the desired habitat condition.

Cost: $300,000 - $500,000 districtwide.

Special Areas

Expected Future Conditions and Outputs

Maintenance of special areas in accordance with the objectives established for them and to protect the values for which they were designated.

Monitoring Questions

1. Are BLM actions and BLM authorized actions consistent with RMP objectives for designated special areas?
2. Are the values of special areas being maintained?

Standards

1. All actions within and adjacent to special areas would be reviewed to determine whether the possibility of impacts on special areas values was considered; whether any mitigation identified as important for maintenance of special area values was required and, if so, was actually implemented.
2. Each special area would be monitored annually to determine if unauthorized uses are occurring and whether special areas values are being maintained.

Costs

An estimated annual average of $15,000 districtwide.

Visual Resources

Expected Future Conditions and Outputs

Preservation of existing visual qualities in VRM class I areas and conservation of visual qualities in VRM Class II and III areas.

Monitoring Question

Are management actions (primarily timber sales) in VRM class II and III areas meeting or exceeding visual resource management class objectives?

Standards

Monitoring would occur on all timber sales and other selected projects in VRM class II areas. It would also occur on 25 percent of sales or projects in VRM class III areas that have special design features or mitigating measures for visual resource protection. This would

evaluate the effectiveness of the practice used to conserve visual resources. The method would consist of a post timber harvest or project construction visit to evaluate success or failure based on professional judgement. In VRM class II management areas, where two or more sales or actions have occurred, impacts would be monitored to determine total cumulative impacts at a minimum interval of five years.

Costs

An estimated $2,000 per resource area annually.

Reforestation and Timber Management Practices

Expected Future Conditions and Outputs

Timber sale levels are as projected in the RMP/EIS. Design and logging of timber sales under the constraints of the RMP are feasible. Harvested units are reforested at a stocking level and managed at an intensity which attains growth and yield that would achieve projected outputs.

Monitoring Questions

1. Are timber sale volumes and harvest acres as projected in the RMP/EIS?
2. Has the BLM been able to design and sell timber sales that meet the standards set forth in the RMP, on all categories of lands where sales were expected during the life of the plan?
3. Were the acres receiving management practices (e.g., planting with genetically selected stock, fertilization, release, and thinning) as projected in the RMP/EIS?
4. Is reforestation achieving desired stocking, particularly in connectivity areas?
5. Are stands growing at a rate that would produce the predicted yields?

Standards

1. & 3. Annual timber sale volumes and acres to be harvested would be identified in annual work plan accomplishment reports.
2. An annual districtwide review would address whether the district was able to offer and sell timber sales that meet RMP standards.
4. First, third, and fifth year stocking surveys would be used.
5. Managed stand inventory (as part of the decadal forest inventory) would provide actual growth data to be reported once every 10 years.

Costs

An estimated $18,000 per resource area annually.

Rural Interface Areas

Expected Future Conditions and Outputs

BLM land within 1/2-mile of identified rural interface areas zoned for 1 to 20-acre lots and BLM-administered land near 40-acre+ zoned areas with homes are managed to mitigate adjacent land owner concerns when reasonable to do so. Forest management practices are altered when reasonably feasible.

Monitoring Question

Are we managing rural interface areas consistent with management practices identified for these areas in the RMP?

Standards

BLM actions within identified rural interface areas would be examined to determine if special project design features and mitigation measures are implemented as planned.

Costs

An estimated $4,000 districtwide annually.

Socioeconomic Conditions

Expected Future Conditions and Outputs

Contribution to local employment and county revenues by providing outputs that support approximately jobs and $___ annually of payments to the O&C counties.

Monitoring Questions

1. What level of local employment is supported by BLM timber sales and forest management practices?
2. What were O&C payments to counties (and CBWR payments)?

Standards

1. Using current multipliers, annual BLM timber sales and harvest volume would be related to supported employment. Similarly, labor-intensive management practices each year would be related to jobs.

2. Annual O&C payments would be reported.

Costs

An estimated $1,000 annually districtwide.

Research

The following list of research topics is considered dynamic and may be modified after completion of the RMP to reflect evolving knowledge and priorities.

Water

Refine/evaluate of a cumulative impact analysis model to assess effects of various management activities (including identification of hydrologic recovery rates) in third to fifth order watersheds.

Identify the roles of first and second order streams on the overall productive capability of the aquatic ecosystem, and the effect of different management prescriptions.

Biological Diversity

Assess the effectiveness of silvicultural systems and silvicultural practices in the retention or enhancement of biological diversity within a forest environment managed for the production of timber and other commodity values.

Develop improved indices and methods for measuring and describing the diversity of habitats and species on forest sites and in determining the effect of silvicultural systems on ecosystem processes, wildlife and plant populations, and species survival.

Evaluate the effectiveness of silvicultural practices and forest genetics programs in retaining the genetic diversity of managed forests, including improved conifer species and other organisms.

Assess the effects of natural fires, prescribed fire, and fire exclusion on the structures and functions of southwestern Oregon ecosystems and upon habitat connectivity.

Assessment of a variety of silvicultural practices, structural retention levels, density management regimes, and species mixes on the stability and health of forest ecosystems.

Wildlife

Develop inventory methods for minor species.

Define habitat requirements and preferences of amphibians and reptiles (particularly those that are special status species).

Develop inventory methods for minor species.

Identify how management activities affect those species and what management prescriptions can minimize impacts on them.

Identify how spotted owls respond to alternative timber harvest prescriptions.

Identify how landscape-level habitat patterns in the checkerboard ownership pattern affect spotted owl occupancy, reproduction, survival and juvenile dispersal.

Identify the vegetation structure characteristics and histories of forest stands used by spotted owls as foraging habitat.

Riparian Zones

Assess the effect of different buffer widths and compositions, and the influence of differing management prescriptions on adjacent lands, on the plants and animals of the riparian zone.

Fish

Assess the effectiveness of various riparian protection prescriptions for maintaining natural stream processes; especially as it relates to production of anadromous and resident fish.

Assess the effects of different management prescriptions on specific fish habitat characteristics as well as fish populations.

Assess the effects of fish habitat improvement projects on aquatic invertebrate fish food sources, as well as fish populations, and the useful life of the projects.

Forestry

Assess the effects of managing stand structure to meet a variety of forest management objectives including the practicality of producing old-growth forest features within shorter rotations.

Determine and improve reforestation, species diversity, timber yield, and ecosystem process results associated with a variety of alternative silvicultural systems.

Develop nonconiferous vegetation in partial-cut forest stands, the effect of such vegetation on conifer reforestation, and the development of effective, ecosystem-based strategies for the affordable management of such vegetation.

Appendix 2-L Wild and Scenic River Suitability Assessments

Introduction

This appendix contains suitability assessments for eight of the 37 river segments determined to be eligible for inclusion as components of the National Wild and Scenic Rivers System. These include:

1. Crabtree Creek (Segment A)
2. Elkhorn Creek
3. Lobster Creek (Segment A)
4. Molalla River (Segment B)
5. Nestucca River (Segment A)
6. North Fork Alsea River
7. South Fork Alsea River
8. Walker Creek

Map 13 shows the location of these river segments within the planning area.

A suitability assessment has not been prepared for the other 29 eligible river segments. To qualify for suitability assessment in the RMP/EIS, the BLM must have sufficient administrative control of lands and resources within an approximately 1/2-mile wide corridor to allow for the protection of river-related values which contribute to the segment's eligibility. For this resource management planning effort, a 40 percent minimum BLM administrative control criteria was used.

RMP/EIS Evaluation Process

The RMP/EIS process for evaluating which river segments within the planning area have potential for addition to the National Wild and Scenic Rivers System involves three steps. A summary of each evaluation step follows.

Determining Eligibility. To be eligible for inclusion as a component of the National Wild and Scenic Rivers System, a river segment must be free flowing and possess at least one river-related outstandingly remarkable value (ORV). These are the only criteria considered in the eligibility determination step.

Establishing Classifications. For each river segment determined to be eligible, a tentative classification of wild, scenic, or recreational river area must be established. River area classification is based on the level and extent of development and accessibility associated with the river segment (see appendix 3-O for specific classification criteria).

Finding of Suitability. For each eligible river segment assessed in the RMP/EIS, a finding must be made as to whether or not it would be a suitable addition to the national system of wild and scenic rivers. Section 4.(a) of the Wild and Scenic Rivers Act provides the following topical guidance for preparing the RMP/EIS suitability assessments contained herein.

1. The characteristics which do or do not make the area a worthy addition to the national system.

2. The current status of land ownership and use in the area.

3. The reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the national system.

4. The federal agency which should administer the river area.

5. The extent to which administrative costs could be shared by state and local government agencies.

6. The estimated acquisition and administrative costs to the United States should the area be added to the national system.

Recommendations to Congress

The January 1991 district *Summary of the Analysis of the Management Situation* (AMS) stated that all river segments found to be suitable for designation in the final RMP/EIS would be further addressed in a subsequent Legislative Environmental Impact Statement (LEIS). An LEIS would enable the Department of the Interior to formally recommend to the President and Congress which suitable river segments should be designated as components of the National Wild and Scenic Rivers System. However, since publication of the AMS summary, it has been decided that the RMP/EIS will be the only document analyzing environmental impacts of the findings of suitability/nonsuitability for the assessed river segments.

Interim Management

For river segments found eligible but not assessed for suitability and those assessed and found suitable, all BLM-administered land and resources within the 1/2-

mile wide river corridors would be afforded a level of interim protective management necessary to protect outstandingly remarkable river-related values. Interim management protection would continue pending formal designation through Congressional legislation.

The Private Lands Issue

The federal government does not manage privately owned lands within designated wild, scenic or recreational river areas. Nor does it have zoning ordinance authority over private lands through the Wild and Scenic Rivers Act. The federal government's ability to affect private lands is primarily through the specific acquisition authorities conferred to the United States in the act. Consequently, except for the acquisition of land or interest in lands, for which just compensation is made, the federal agencies cannot regulate the use of privately owned lands within designated river corridors via the Wild and Scenic Rivers Act. Section 6 of the Wild and Scenic Rivers Act prohibits managing agencies from acquiring fee title to an average of more than 100 acres per river mile within a 1/2-mile wide corridor. Condemnation in fee title may not occur if 50 percent or more of the designated area is already owned by the United States and/or public agencies. Furthermore, the managing federal agency may not condemn and acquire lands or interests in lands zoned by incorporated cities, villages, counties or boroughs if their respective ordinances are consistent with the purposes of the Act (University of Oregon, Dept. of Planning, Public Policy and Mgt. 1991).

In addition, private land ownership is a legitimate condition within the administrative boundaries of a designated component of the National Wild and Scenic Rivers System. Uses of privately owned lands and resources are often consistent with wild, scenic or recreational river area management goals and objectives. Carefully conducted ranching, farming, mining and forest management activities within scenic and recreational river area classifications may continue as practiced. Assistance to private landowners may be provided by the federal government to encourage management practices which enhance a river segment's natural values and conditions.

Outstandingly Remarkable Values Comparison

The Salem District, in cooperation with the Eugene District and three national forests (Mt. Hood, Siuslaw and Willamette), compared ORVs among the eight eligible river segments assessed in this RMP/EIS and other eligible river segments located within and adjacent to the planning area. See appendix 2-F for the specific criteria used for this cooperative effort. For consistency, and to maintain a reasonable area for comparison, the existing statewide comprehensive outdoor recreation plan (SCORP) geographic regions 5, 7 and 8 were utilized. An eligible river segment's suitability in each of the RMP/EIS alternatives was based on whether or not one or more of its identified ORVs ranked among the top four (alternative D), top two (alternative C), or top one (alternative B) river(s) within its respective SCORP geographic region. The following table shows by SCORP geographic region, the district's eligible river segments which ranked among the top four rivers in one or more ORV categories. The South Fork Alsea River is the only segment not shown because its sole ORV did not rank among the top four rivers in its region of comparison.

Public Comment

Public comment regarding which of the eight eligible river segments assessed in the RMP/EIS have potential for addition to the national system varied. Based on comments received from public review of the district's AMS, there appears to be substantial public concern regarding several of the study segments. These concerns are identified in the individual assessments which follow in this appendix.

Potential Hydroelectric Power

The potential hydroelectric power theoretically available in any stream reach is determined by the formula $P = cQHe$, where:

- P = power (kilowatts)
- c = conversion factor (0.08475)
- Q = streamflow (feet^3/second)
- H = head (feet)
- e = efficiency (1.0)

Streamflow (Q) was determined at the midpoint of the stream reach being analyzed, based on available streamflow records and/or on estimated drainage basin runoff. Head (H) was determined as the total fall in the entire length of the stream reach. Streamflow had to be at least 35 ft^3/second for a particular stream reach to be considered to have hydroelectric power potential.

Using data contained in the Oregon State University Water Resources Research Institute's 1979 study titled "A Resource Survey of Low-Head Hydroelectric Power Potential in Oregon", the theoretical hydropower potential for each of the river segments assessed in this RMP/EIS has been determined. This potential, expressed in kilowatts, is presented in each of the following separate suitability assessments.

Suitability Assessments

Each of the eight suitability assessments which follow contain a summary section which generally describes the river segment assessed and the finding of suitability or nonsuitability. For river segments found to be suitable, a tentative river area classification is also stated. A more detailed description of the river segment and other factors considered in the suitability/ nonsuitability finding follows the summary.

Outstandingly Remarkable Value Ranking, by SCORP Geographic Regions 5, 7 and 8, for Assessed Eligible River Segments which Ranked Among the Top Four Rivers In One or More Value Category

Region 5

River Segment Name	Outstandingly Remarkable Value[1] Ranking S	R	G	F	W	H	C	O
Alsea River	4	2	-	X	-	-	-	-
Drift Creek	1	-	-	-	-	-	-	-
Nestucca River (Segment A)	3	1	-	1	-	-	-	-
North Fork Siletz River	-	-	-	X	-	-	-	1
Siletz River	2	3	-	4	-	-	-	-
Trask River	-	X	-	3	-	-	-	-
Wilson River	-	4	-	2	-	-	-	-

[1]S = Scenic, R = Recreation, G = Geologic, F = Fish, W = Wildlife, H = Historic, C = Cultural, O = Other (Biological/Botanical/Ecological/Hydrological)

1 = ranked first, 2 = ranked second, 3 = ranked third, 4 = ranked fourth, X = ORV present, but not a top four ranked value

Region 7

River Segment Name	Outstandingly Remarkable Value[1] Ranking S	R	G	F	W	H	C	O
Clackamas River (upper)	X	1	-	4	3	4	1	3
Collawash River	-	-	3	X	-	-	-	-
Eagle Creek	-	-	-	X	4	-	-	-
Molalla River	X	4	4	-	-	-	-	-
Roaring River	4	X	-	X	-	-	-	4
Salmon River	2	3	X	2	2	-	-	2
Sandy River (lower)	3	2	2	1	1	-	-	1
Sandy River (middle Segment A)	-	X	-	X	-	2	-	-
Sandy River (middle Segment B)	X	X	-	3	-	1	-	-
Sandy River (upper)	1	X	1	X	-	-	-	X
Zig Zag River	-	-	-	-	-	3	2	-

[1]S = Scenic, R = Recreation, G = Geologic, F = Fish, W = Wildlife, H = Historic, C = Cultural, O = Other (Biological/Botanical/Ecological/Hydrological)

1 = ranked first, 2 = ranked second, 3 = ranked third, 4 = ranked fourth, X = ORV present, but not a top four ranked value

Region 8

River Segment Name	S	R	G	F	W	H	C	O
	Outstandingly Remarkable Value[1] Ranking							
Crabtree Creek (Segment A)	X	X	-	-	X	-	4	X
Elkhorn Creek	4	-	-	-	2	-	-	-
Lobster Creek (Segment A)	-	-	-	4	-	-	-	-
McKenzie River	1	1	-	1	-	X	2	-
Middle Fork Willamette River	X	4	-	3	3	X	3	X
North Fork Alsea River	X	-	-	X	1	-	-	-
North Fork Breitenbush River	X	X	X	-	-	-	-	2
North Fork MiddleX Fork Willamette River	X	-	-	4	X		3	
North Santiam River	-	2	-	-	X	-	-	4
Opal Creek	3	-	X	-	-	-	-	X
South Santiam River	2	3	-	2	X	-	1	-
Walker Creek	-	-	-	-	-	-	-	1

[1]S = Scenic, R = Recreation, G = Geologic, F = Fish, W = Wildlife, H = Historic, C = Cultural, O = Other (Biological/Botanical/Ecological/Hydrological)

1 = ranked first, 2 = ranked second, 3 = ranked third, 4 = ranked fourth, X = ORV present, but not a top four ranked value

Wild and Scenic River Suitability Assessment Crabtree Creek (Segment A)

Part I. Finding and Rationale

Finding

A 2.2-mile segment of Crabtree Creek from its headwaters to the Kiote Creek Road crossing is found not suitable for designation as a component of the National Wild and Scenic Rivers System.

Rationale

Based on the ORV comparison of Crabtree Creek and other rivers in SCORP region 8, Crabtree Creek's cultural value was ranked only fourth. The other values, though outstandingly remarkable, did not rank in the top four. The quality of these identified ORVs would be maintained by resource protection measures associated with existing and proposed OGEA, ACEC and RMA allocations. These resource protection measures would meet or exceed those that would occur if the river were designated at the scenic river area classification. Management activities resulting from these allocations would allow natural systems to function with a minimum level of human interference. Over the long term, the biodiversity of the area would be maintained.

In addition, public input regarding this segment's potential inclusion as a component of the National Wild and Scenic Rivers System has included no responses favoring designation. Several respondents opposed inclusion of this or any other river into the national system.

Part II. Background

Description of the River-Related Environment

The Salem District Office staff identified as eligible a 2.2-mile segment of Crabtree Creek from its headwaters to the Kiote Creek Road crossing. This segment is located in Secs. 8 and 16, T. 11 S., R. 3 E., W.M., (see map). The segment lies near the 3,400-foot level on the western slope of the Cascade Range, about 32 miles east of Albany, Oregon.

Much of this segment (approximately 60 percent of the corridor) flows through an old-growth stand of Douglas-fir, western hemlock, and western redcedar. Many trees are 500-900 years old, making this the oldest stand of relatively undisturbed forest in the Salem District, as well as Oregon. In addition to the old-growth forest that surrounds much of the segment, a 3-acre natural lake, Crabtree Lake, is located near its headwaters. A wetland area and beaver pond are located just below the lake, and create a diverse wildlife habitat area. A recently installed earth and log blockade prevents vehicular access to the lake and headwaters area. The old roadbed can be easily walked the 100 to 150 yards from the undeveloped parking area below the blockade to the lake.

The primary use within the corridor is dispersed recreation.

This segment of Crabtree Creek is not identified as having any problems regarding water quality conditions in the 1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution. Current water quality does not affect the segment's eligibility for inclusion as a component of the National Wild and Scenic Rivers System.

Eligibility Determination

Upon evaluation, Crabtree Creek was found to be free flowing within the 2.2-mile segment. Five river-related resource values (scenic, recreational, wildlife, cultural and botanical/ecological) were determined to be outstandingly remarkable based on established eligibility criteria. A description of each ORV follows:

The scenic qualities of this river corridor are characterized by a wide range of colors and textures, ranging from rock outcrops and open spaces to dense, relatively undisturbed old-growth forest. The scenic value of this river corridor has gained additional significance because of the relative scarcity of publicly accessible old-growth forest of this age. This is considered by many to be the forest age class where scenic quality has reached its optimal level.

The combination of day hiking, fishing, and opportunities for studying nature (botanical and wildlife) contribute to the outstanding recreational value of this river corridor. In addition to visitors traveling from within the region to participate in the various recreational activities, visitors originating from outside the region are attracted because of the corridor's unique values.

The wildlife values of the Crabtree Creek corridor include outstanding habitat for a variety of animal species, including Roosevelt elk and one documented pair of threatened northern spotted owls. The corridor

is considered an outstanding example of relatively undisturbed old-growth habitat within the region.

Although little cultural inventory work has been completed to date, the high density of known sites within this river corridor, (4 in 2.2 river miles), makes it likely that one or more may be unique, unusual, or regionally significant.

The river corridor is rich in botanical/ecological diversity and is an exceptional example of a relatively undisturbed old-growth ecosystem. Its accessibility also makes it an important resource for botanical/ecological study.

Tentative Classification

The highest potential classification for this segment of Crabtree Creek was found to be scenic river area, based on the conditions shown in the following table.

The segment is free of any impoundments or diversions. Streambank modifications are limited to the culvert and riprap associated with two road crossings. No shoreline development is present along the segment, including the area around Crabtree Lake. Forest management activities on nearby hillsides are generally well screened from most areas along the creek. Water quality and quantity are considered relatively good and augment the identified ORVs (see previous discussion of water quality in this part).

Access along this segment is via a lightly traveled, all weather rock-surfaced road that roughly parallels much of the segment. The road is not visible from Crabtree Creek except at two road crossings, one of which is at the segment's lower terminus. Road noise is unnoticeable from all but a few locations along this segment. The road's primary use is for recreational access to the lake and surrounding old-growth forest.

Public Comment

The BLM, as part of its RMP process, solicited public review and comment on the district's AMS. Public comment regarding this segment's eligibility and tentative river area classification determination was minimal. Of the comments received, most were concerned with the Wild and Scenic Rivers Act and provisions of the act rather than this particular segment's eligibility or tentative classification determination.

Part III. Suitability Factors

Current Land Status and Use

Land Ownership

All lands within the approximately 1/2-mile wide river corridor are administered by the BLM Salem District. Total acreage within the corridor is approximately 682 acres.

Land Use

Current land use within the approximately 1/2-mile wide river corridor is limited to dispersed recreation activities, primarily fishing and hiking, and ongoing scientific research and study within portions of the Carolyn's Crown RNA lying within the corridor. Although timber management practices have occurred in the past, there are no plans, in the short term, to harvest timber in the corridor.

Site Condition	Classification		
	Wild River Area	Scenic River Area	Rec. River Area
Water Resources Development	Meets	Meets	Meets
Shoreline Development	Does Not Meet	Meets	Meets
Water Quality	Meets	Meets	Meets
Accessibility	Does Not Meet	Meets	Meets

Reasonably Foreseeable Uses of the Land and Water Affected by Designation

Appendix 2-F of this RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in appendix 4-K.

Uses Enhanced by Designation

Designation under a scenic or recreational river area classification would result in a continuation of current management, except that BLM's management presence would increase, potentially deterring inappropriate activities and thus enhancing recreational and scientific study uses within the river corridor. In addition, if designated at either classification, more funding may be available to improve maintenance of the existing access road, to complete activity planning within the corridor and to initiate facility development and visitor interpretation.

Uses Foreclosed by Designation

Designation under either a scenic or recreational river area classification would not lead to the foreclosure of any current or reasonably foreseeable potential uses of the land.

Uses Curtailed by Designation

Designation under a scenic river area classification would lead to VRM class II management of BLM-administered lands in the approximately 1/2-mile wide river corridor, constraining timber harvest on those lands available for harvest.

Theoretical Hydroelectric Power Potential

The average annual streamflow for this segment of Crabtree Creek is less than 35 ft^3/sec. Based on this finding, the hydropower potential for this stream segment was not further reviewed (see introduction for more information).

There are no Federal Energy Regulatory Commission applications or other proposals for dams or diversions on file for this segment.

Effects On Outstandingly Remarkable Values (ORVs)

(ORVs enhanced or maintained if the river segment were designated.)

Designation under a scenic river area classification would ensure that the scenic qualities of this river corridor would be maintained. Forest management activities determined to have the potential to adversely impact the scenic quality of the area would be constrained. Timber harvest on the majority of the land within the corridor is currently constrained due to other protection measures. Designation would therefore have little effect on visual protection within the majority of the corridor, although the small area not currently protected by other allocations may benefit from designation.

Recreation activities including studying nature (botanical and wildlife) and day hiking would be enhanced by designation through an increased management presence. This may deter some undesirable activities associated with unregulated use, such as litter and vandalism.

The wildlife resource within the corridor would be maintained by designation under a scenic river area classification through scenic quality protection measures. These would maintain wildlife habitat by constraining the amount of timber harvest on those lands available for harvest.

Cultural values within the corridor would be maintained by designation under a scenic river area classification through greater management presence. This increased management presence would enhance the probability that existing sites, and any sites identified in the future, would be protected .

The botanical/ecological values of the corridor would be maintained by designation under a scenic river area classification through direct benefits of timber management constraints to protect scenic values.

Designation of this segment under a recreational river area classification would maintain all identified ORVs at their current levels.

ORVs Diminished if the River Segment were not Designated

The identified ORVs (scenic, recreational, wildlife, cultural and botanical/ecological) of this river segment would not be diminished if designation does not occur. Management of the river corridor would be substantially the same with or without designation.

How the River Segment would be Managed if not Designated

If the river segment were not added to the National Wild and Scenic Rivers System, BLM intends to manage lands and resources under its jurisdiction within the approximately 1/2-mile wide river corridor in accordance with allocations of the PA. These allocations would be OGEA, Shafer/Crabtree Creek ACEC, and an RMA. These often overlapping allocations would cover nearly the entire river corridor. The level of protection provided by these allocations would protect all identified ORVs at current levels.

Administering Agency

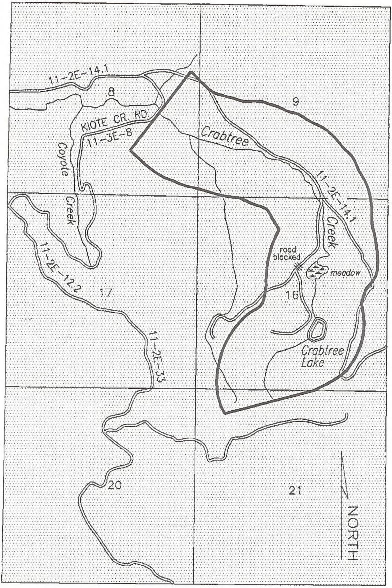
If this segment of Crabtree Creek were ultimately designated by Congress as a component of the National Wild and Scenic Rivers System, the BLM would be the logical managing agency.

Cost of Administration

The estimated cost of preparing a required river management plan would be $40,000. Estimated annual river management, administration, and monitoring costs would be $10,000. Cost estimates for implementing resource protection measures and developing necessary public use facilities would be determined through the river management planning process.

Since all lands within this river corridor are administered by the BLM, no state or local agency would share in the cost of future administration and management if designation occurs.

Because there are no privately owned lands within this river corridor, the issue of acquisition costs to the United States would be moot.



Note: District generated map through non-cartographic methods

LEGEND

Possible Wild and Scenic Management Boundary (1/4 mile each side)

Land Under Public Jurisdiction

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Salem District 1992 RMP/EIS

WILD AND SCENIC RIVER SUITABILITY ASSESSMENT

CRABTREE CREEK

Oregon

0 1/2 1 Miles

Wild and Scenic River Suitability Assessment Elkhorn Creek

Part I. Finding and Rationale

Finding

A 3.0-mile segment of Elkhorn Creek from the Willamette National Forest boundary to the Elkhorn Creek Road crossing is found not suitable for designation as a component of the National Wild and Scenic Rivers System.

Rationale

Based on the ORV comparison of Elkhorn Creek and other rivers in SCORP region 8, Elkhorn Creek's scenic value ranked fourth and its wildlife value ranked second. The identified quality of these ORVs would be maintained by resource protection measures associated with existing and proposed TPCC and RMA allocations, and an OGEA. These allocations preclude or restrict timber harvest on approximately 80 percent of lands within the corridor, including all lands within 200 feet of the river. Scenic values of this river corridor would be adequately protected by these measures largely because any timber harvest in the future would be permitted only in areas beyond the rim of cliffs adjacent to the river, and thus outside the river's viewshed. Wildlife habitat on the majority of lands within the corridor is also currently protected by the above mentioned allocations. Over the long term, the existing conditions and values of the river corridor would be maintained.

In its recent land use plan, the Forest Service analyzed the upper portion of the Elkhorn Creek drainage and other drainages in the area. No special management provisions were identified for the upper portion of this drainage in this plan. The area under Forest Service administration will be examined further in their Elkhorn Cedar EIS.

Public input regarding this segment's potential inclusion into the National Wild and Scenic Rivers System has included no responses favoring designation. Several respondents opposed inclusion of this or any other river into the national system.

Part II. Background

Description of the River-Related Environment

The Salem District Office staff identified as eligible a 3.0-mile segment of Elkhorn Creek from the Willamette National Forest boundary to the Elkhorn Creek Road crossing. This segment is located in Sec. 1, T. 9 S., R. 3 E., and Secs. 5 and 6, T. 9 S., R. 4 E., W.M. (see map) and lies near the 1,500-foot level on the western slope of the Cascade Range about 35 miles east of Salem, Oregon.

Much of this segment flows through a relatively undisturbed stand of mature and remnant old-growth Douglas-fir, and western hemlock and western redcedar. The river carves a scenic canyon with near-vertical cliffs extending to the river. Many interesting rock formations and small waterfalls are present throughout the segment.

Public access to the lower terminus of this segment is via a private, unpaved road that crosses Elkhorn Creek about 200 yards above its confluence with the Little North Santiam River. The remainder of the segment is accessible only by foot. Current use within the river corridor is very low, and is limited primarily to dispersed recreational activities.

This segment of Elkhorn Creek is not identified as having any problems regarding water quality conditions in the 1988 Oregon Statewide Assessment of Nonpoint Sources Of Water Pollution. Current water quality does not affect the segment's eligibility for inclusion as a component of the National Wild and Scenic Rivers System.

Eligibility Determination

Upon evaluation, Elkhorn Creek was found to be free flowing within the 3.0-mile segment. Two river-related resource values (scenic and wildlife) were determined to be outstandingly remarkable based on established eligibility criteria. A description of each ORV follows:

The scenic qualities of this river corridor are characterized by a wide range of colors and textures, exhibited by a variety of features ranging from vertical rock outcrops to dense, relatively undisturbed mature and old-growth forest. The water component of the corridor's scenic quality ranges from rushing whitewater and waterfalls to deep, clear pools punctuated by moss-covered boulders and overhanging ferns. Little evidence of human intrusion into the corridor is present.

The wildlife values of the Elkhorn Creek corridor include outstanding habitat conditions for a variety of animal species including elk, various cliff-dwelling species and one documented pair of threatened northern spotted owls. The corridor is one of the few undisturbed canyon ecosystems in the foothill region of the Cascade Range.

Tentative Classification

The highest potential classification for this segment of Elkhorn Creek was found to be wild river area based on the conditions shown in the following table.

The segment is free of any impoundments, diversions, or streambank modifications. No shoreline development is present along the segment. Forest management activities within this corridor are limited to a 1966 40-acre clearcut that has since been replanted, and a mid-seventies mortality salvage harvest near the segment's lower terminus. Neither of these disturbances affected the tentative classification determination. Water quality and quantity are considered relatively good and augment the identified ORVs (see previous discussion of water quality in this part).

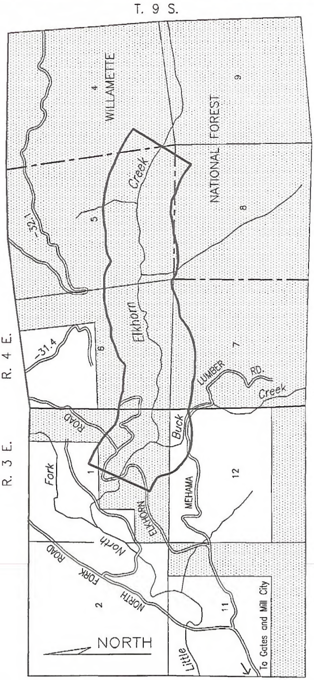
Vehicular access to this segment is via a lightly traveled, private, unpaved road that crosses Elkhorn Creek at the segment's lower terminus. The road's primary use is for access to several private residences and areas used for dispersed recreation activities. The remainder of this segment is in a backcountry setting accessible by foot travel only. No roads or trails parallel or cross the identified segment for its entire length.

Public Comment

The BLM, as part of its RMP process, solicited public review and comment on the district's AMS. Public comment regarding this segment's eligibility and tentative river area classification determination was minimal. Of the comments received, most were concerned with the Wild and Scenic Rivers Act and provisions of the act rather than this particular segment's eligibility or tentative classification determination.

Site Condition	Classification		
	Wild River Area	Scenic River Area	Rec. River Area
Water Resources Development	Meets	Meets	Meets
Shoreline Development	Meets	Meets	Meets
Water Quality	Meets	Meets	Meets
Accessibility	Meets	Meets	Meets

Landowner	Approximate acres within 1/2 mi. wide corridor	% of total area within corridor
Public: BLM	812	90
Private: Frank Lumber Co.	86	10
Total	898	100



Note: District generated map through non-cartographic methods

LEGEND

Possible Wild and Scenic Management Boundary (1/4 mile each side)

Land Under Public Jurisdiction

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Salem District 1992 RMP/EIS

WILD AND SCENIC RIVER SUITABILITY ASSESSMENT

ELKHORN CREEK

Oregon

0 1/2 1 Miles

Part III. Suitability Factors

Current Land Status and Use

Land Ownership

Ninety percent (812 acres) of the approximately 1/2-mile wide river corridor are O&C lands administered by the BLM Salem District. The remaining ten percent (86 acres) of the corridor is privately owned, although no private land borders the river itself.

Land Use

Current land use within the approximately 1/2-mile wide river corridor is limited primarily to occasional dispersed recreation activity (fishing for cutthroat trout and hiking). TPCC restrictions preclude or limit timber management activities throughout much of the upper river corridor. While the lower portion of the corridor is currently available to most timber management practices, there are no plans for timber harvest during the short term period.

Reasonably Foreseeable Uses of the Land and Water Affected By Designation

Appendix 2-F of this RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in appendix 4-K.

Uses Enhanced By Designation

Designation under a wild or scenic river area classification would lead to increased visual resource protection along the entire river corridor. This would potentially enhance recreational uses within the river corridor. In addition, the BLM's management presence would increase, potentially deterring inappropriate activities and thus enhance recreational use within the river corridor.

Designation under a recreational river area classification would result in a continuation of current management, except that BLM's management presence would increase. This would potentially deter inappropriate activities and enhance recreational use within the river corridor.

Uses Foreclosed by Designation

Designation under a wild river area classification would lead to the foreclosure of timber harvest and its associated activities within the corridor.

Designation under a scenic or recreational river area classification would not lead to the foreclosure of any current or reasonably foreseeable potential uses of the land.

Uses Curtailed by Designation

Designation under a scenic river area classification would lead to VRM class II management of BLM-administered lands in the approximately 1/2-mile wide river corridor. Timber harvest on those lands in available for timber harvest would be constrained.

Designation under a recreational river area classification would not curtail any current or reasonably foreseeable potential uses of the land or water.

Theoretical Hydroelectric Power Potential

The potential hydropower theoretically available from this segment of Elkhorn Creek is approximately 2,500 kilowatts (see introduction for more information).

There are no Federal Energy Regulatory Commission applications or other proposals for dams or diversions on file for this river segment.

Effects On Outstandingly Remarkable Values (ORVs) (ORVs enhanced or maintained if river segment were designated.)

Designation under a wild or scenic river area classification would ensure that the scenic value of this river corridor would be maintained. Timber harvest activities that would have the potential to adversely impact the scenic quality of the area would not be allowed in the corridor.

The wildlife resource within the corridor would be maintained by designation under a wild or scenic river area classification through implementation of scenic quality protection measures. These would enhance wildlife habitat.

Designation of this segment under a recreational river area classification would maintain identified ORVs at a level that would perpetuate their outstandingly remarkable condition.

ORVs Diminished if the River Segment were not Designated

The identified ORVs (scenic and wildlife) of this river segment are not expected to be diminished if designation does not occur. Management of the river would be substantially the same with or without designation.

How the River Segment would be Managed if not Designated

If the river were not added to the National Wild and Scenic Rivers System, the BLM intends to manage lands and resources under its jurisdiction within the approximately 1/2-mile wide river corridor in accordance with allocations of the PA. These allocations would be OGEA, RMA and various TPCC classifications. Timber harvest would be restricted in the RMA. The TPCC allocations in the upper portion of this segment preclude or restrict timber harvest. A portion of the area would be withdrawn from timber harvest to protect existing northern spotted owl habitat in the OGEA.

Administering Agency

If this segment of Elkhorn Creek were ultimately designated by Congress as a component of the National Wild and Scenic Rivers System, the BLM would be the logical managing agency.

Cost of Administration

The estimated cost of preparing a required river management plan would be $40,000. Estimated annual river management, administration, and monitoring costs would be $10,000. Cost estimates for implementing resource protection measures and developing necessary public use facilities would be determined through the river management planning process.

Since the majority of lands within this river corridor are administered by the BLM, and only a small percentage is privately owned, no state or local agency would be expected to share in the cost of future administration and management.

Private lands within the river corridor are near the outer edge of the corridor boundary. These lands are not considered vital to the protection of the identified ORVs. This, in combination with the 90 percent federal control of lands within the corridor, means acquisition costs to the United States would not be expected with designation of this segment.

Wild and Scenic River Suitability Assessment
Lobster Creek (Segment A)

Part I. Finding and Rationale

Finding

A 4.6-mile segment of Lobster Creek from its confluence with South Fork Lobster Creek to its confluence with Bear Creek is found not suitable for designation as a component of the National Wild and Scenic Rivers System.

Rationale

Based on the ORV comparison of Lobster Creek and other rivers in SCORP region 8, Lobster Creek's fish value ranked only fourth. The level of protection provided by the RMA and OGEA allocations would maintain the fish ORV. Since the OGEA would be managed with an emphasis on biodiversity and improving habitat, no final harvest operations would be planned. Little impact on the fish value is anticipated.

In addition, there was substantial public comment opposing the designation of this segment.

Part II. Background

Description of the River-Related Environment

The Salem District Office staff identified as eligible a 4.6-mile segment of Lobster Creek from its confluence with South Fork Lobster Creek to its confluence with Bear Creek. This segment is located in Secs. 15, 22, 26, 27, 35 and 36, T. 15 S., R. 8 W., W.M. (see map), near the 800-foot level on the western slope of the Coast Range about 10 miles southwest of Alsea, Oregon.

Much of this segment flows through dense riparian vegetation that shades the segment and obscures views of adjacent hillsides in most areas. The stream carves a shallow canyon with moderately steep hillsides covered with stands of Douglas-fir of various age classes. The stream is characterized by riffles and shallow, clear pools. Stream gradient is fairly low throughout the segment.

Primary uses within the corridor include timber management activities and occasional recreational fishing for resident cutthroat trout.

The lower portion of this segment of Lobster Creek was identified as having moderate problems regarding water quality conditions in the 1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution. Current water quality does not affect the segment's eligibility for inclusion as a component of the National Wild and Scenic Rivers System.

Eligibility Determination

Upon evaluation, Lobster Creek was found to be free flowing within the 4.6-mile segment. One river-related resource value, fish, was determined to be outstandingly remarkable based on established eligibility criteria.

The fish value of this stream segment includes exceptionally high quality spawning habitat throughout much of the segment and populations of several regionally important anadromous fish species. The stream is a top producer of wild and hatchery fall chinook salmon, coho salmon, and winter steelhead.

Tentative Classification

The highest potential classification for this segment of Lobster Creek was found to be recreational river area based on the conditions shown in the following table.

The segment is free of any impoundments or diversions. Streambank modifications are limited to culverts and riprap associated with several road crossings. Little shoreline development is present along the segment. Forest management activities on nearby hillsides are generally well screened, but are visible in several areas along the segment. Water quality and quantity are relatively good and support the identified ORV.

Access to this segment is via a lightly traveled, paved and unpaved road that roughly parallels much of the segment. The road is visible from many locations along the segment. Road noise is noticeable from the streambank throughout its length. The road's primary use is for access to upstream timber management projects.

Public Comment

The BLM, as part of its RMP process, solicited public review and comment on the district's AMS. Public comment regarding this segment's eligibility and tentative river area classification determination was substantial. The majority of respondents did not refute the eligibility determination, but opposed the potential designation of this segment. Concerns included: fear of land use restrictions, condemnation, increased visitor use and impacts, and government interference with private citizens' rights.

Part III. Suitability Factors

Current Land Status and Use

Land Ownership

All lands within the approximately 1/2-mile wide river corridor are administered by the BLM Salem District. Total acreage within the corridor includes approximately 1,214 acres of O&C land and 73 acres of public domain land.

Land Use

Land use within the river corridor is limited primarily to timber management activities and dispersed recreation. Most of the corridor is currently open to timber management practices. No land within the corridor has been harvested in the past 10 years.

Site Condition	Classification		
	Wild River Area	Scenic River Area	Recreational River Area
Water Resources Development	Meets	Meets	Meets
Shoreline Development	Does Not Meet	Meets	Meets
Water Quality	Meets	Meets	Meets
Accessibility	Does Not Meet	Does not Meet	Meets

Reasonably Foreseeable Uses of the Land and Water Affected by Designation

Appendix 2-F of this RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in appendix 4-K.

Uses Enhanced By Designation

Designation under the recreational river area classification would result in a continuation of current management, except that BLM's management presence would increase, potentially diminishing inappropriate uses and thus enhancing recreational use within the river corridor.

Uses Foreclosed by Designation

Designation under the recreational river area classification would not lead to the foreclosure of any current or reasonably foreseeable potential uses of the land or water.

Uses Curtailed by Designation

Designation under the recreational river area classification would not curtail any current or reasonably foreseeable potential uses of the land or water.

Theoretical Hydroelectric Power Potential

The potential hydropower available from this segment of Lobster Creek is approximately 2,100 kilowatts (see introduction for more information).

There are no Federal Energy Regulatory Commission applications or other proposals for dams or diversions on file for this river segment.

Effects On Outstandingly Remarkable Values (ORVs)

ORVs enhanced or maintained if river segment were designated

The fish value of this segment would be maintained or potentially enhanced by designation under the recreational river area classification through an anticipated increase in funding for fish management and enhancement projects.

ORVs Diminished if the River Segment were not Designated

The fisheries value of the river segment would not be expected to diminish if designation does not occur.

How the River Segment would be Managed if not Designated

If the river were not added to the National Wild and Scenic Rivers System, BLM intends to manage lands and resources under its jurisdiction within the approximately 1/2-mile wide river corridor in accordance with allocations of the PA. These allocations would be OGEA and RMA. Lands within the approximately 1/2-mile wide corridor, but outside the RMA, would be within the boundaries of an OGEA and as such would only be harvested under special conditions. The identified fish ORV would be protected under this management.

Administering Agency

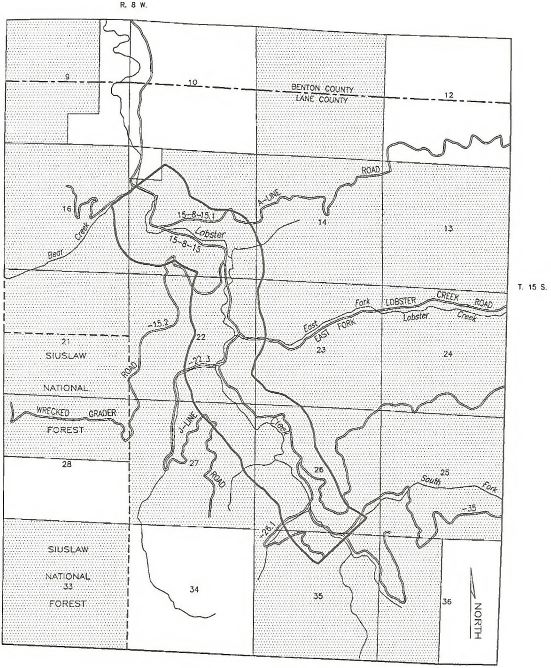
If this segment of Lobster Creek were ultimately designated by Congress as a component of the National Wild and Scenic Rivers System, the BLM would be the logical managing agency.

Cost of Administration

The estimated cost of preparing a required river management plan would be $40,000. Estimated annual river management, administration, and monitoring costs would be $10,000. Cost estimates for implementing resource protection measures and developing necessary public use facilities would be determined through the river management planning process.

Since all lands within this river corridor are administered by the BLM, no state or local agency would share in the cost of future administration and management if designation occurs.

Because there are no privately owned lands within this river corridor, the issue of acquisition costs to the United States would be moot.



Note: District generated map through non-cartographic methods

LEGEND

Possible Wild and Scenic Management Boundary (1/4 mile each side)

Land Under Public Jurisdiction

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Salem District 1992 RMP/EIS

WILD AND SCENIC RIVER SUITABILITY ASSESSMENT

LOBSTER CREEK

Oregon

0 1/2 1 Miles

Wild and Scenic River Suitability Assessment North Fork Alsea River

Part IV. Finding and Rationale

Finding

A 10.7-mile segment of the North Fork Alsea River from the outlet of Klickitat Lake to its confluence with Bailey Creek is found not suitable for designation as a component of the National Wild and Scenic River System.

Rationale

Based on the ORV comparison of the North Fork Alsea River and other rivers in SCORP region 8, the North Fork Alsea River's wildlife value was ranked first. The other identified ORVs did not rank in the top four. The level of protection provided by the OGEA allocation would protect the identified ORVs (scenic, fish and wildlife). Since the OGEA would be managed with an emphasis on biodiversity and improving wildlife habitat, no final harvest operations would be planned and little impact on the segment is anticipated. The RMA and VRM restrictions within this corridor would also protect the identified ORVs.

In addition, public input regarding this segment's potential inclusion as a component of the National Wild and Scenic Rivers System has included a substantial number of responses opposing designation.

Part II. Background

Description of the River-Related Environment

The Salem District Office staff identified as eligible a 10.7-mile segment of the North Fork Alsea River from the outlet of Klickitat Lake to its confluence with Bailey Creek. This segment is located in Sec. 33, T. 12 S., R. 8 W., W.M., Secs. 19 and 20, T. 13 S., R. 7 W., W.M., and Secs. 2, 3, 12, 13 and 24, T. 13 S., R. 8 W., W.M., (see map). The segment lies near the 800-foot level on the western slope of the Coast Range, about five miles north of Alsea, Oregon.

Portions of this segment flow through a relatively undisturbed stand of mature and remnant old-growth Douglas-fir, western hemlock, and western redcedar. In other areas, timber on adjacent hillsides has been recently harvested or is in the process of being harvested. Most of these areas are screened from view by a riparian buffer, but others are clearly visible.

Access to this river segment is via an unpaved BLM and private road system used primarily by logging trucks and other vehicles associated with timber harvest activities. It is also used to a lesser degree by fishermen and hikers traveling to areas within the river corridor.

This segment of the North Fork Alsea River was not identified as having any problems regarding water quality conditions in the 1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution. Current water quality does not affect the segment's eligibility for inclusion as a component of the National Wild and Scenic Rivers System.

Eligibility Determination

Upon evaluation, the North Fork Alsea River was found to be free flowing within the 10.7-mile segment. Three river-related resource values (scenic, fish, and wildlife) were determined to be outstandingly remarkable based on established eligibility criteria. A description of each ORV follows:

The scenic qualities of this river corridor range from dense mature forest to steep rocky outcrops descending into the river. The visual quality of the upper and lower portions of this segment is moderately impacted by timber management in many areas. The character of the river corridor changes near the middle of the segment as it descends into a deep isolated canyon. The canyon exhibits a wide range of colors and textures, ranging from rock outcrops and open spaces to dense, relatively undisturbed forest. Although timber management actions in scattered areas of the segment detract from scenic quality, the overall scenic value of this river segment is considered to be outstanding.

The fish value of this river segment includes a substantial population of resident cutthroat trout and exceptional habitat throughout the segment. Sediment levels within this segment remain relatively low year-round and many areas are suitable as spawning and rearing habitat. The overall production of resident cutthroat trout is among the highest in the region.

The wildlife values of this river corridor include outstanding habitat for a variety of animal species including elk and one documented pair of threatened northern spotted owls. The habitat consists of blocks of relatively undisturbed mature forest with scattered remnant old-growth trees in the stand.

Tentative Classification

The highest potential classification for this segment of the North Fork Alsea River was found to be scenic river area based on the conditions shown in the following table.

The identified segment is free of any impoundments or diversions. Streambank modifications are limited to bridges, culverts and riprap associated with several road crossings. No shoreline development is present along the segment. Forest management activities on nearby hillsides are generally well screened from most areas of the segment, although some clearcuts are visible from the river along portions of the segment. Water quality and quantity are relatively good and augment the identified ORVs (see previous discussion of water quality in this part).

Access to this segment is via a lightly traveled, unpaved road system that roughly parallels much of the upper and lower segment. Vehicular noise is noticeable from many places in the upper half of the river segment. The primary use of this road system is for access to areas being managed for timber production.

Public Comment

The BLM, as part of its RMP process, solicited public review and comment on the district's AMS. Public comment regarding this segment's eligibility and tentative river area classification determination was substantial. The majority of respondents did not refute the eligibility determination, but opposed the potential designation of this segment. Concerns included: fear of land use restrictions, condemnation, increased visitor use and impacts, and government interference with private citizens' rights.

Part III. Suitability factors

Current Land Status and Use

Land Ownership

Fifty-three percent (1,455 acres) of lands within the approximately 1/2-mile wide river corridor are administered by the BLM Salem District. The remainder of lands within the corridor are privately owned.

Land Use

Land use within the approximately 1/2-mile wide river corridor is limited primarily to dispersed recreation and timber management activities. Overall recreational use is very low. Approximately 200 acres of land within the corridor have been harvested in the past 10 years.

Site Condition	Classification		
	Wild River Area	Scenic River Area	Recreational River Area
Water Resources Development	Meets	Meets	Meets
Shoreline Development	Meets	Meets	Meets
Water Quality	Meets	Meets	Meets
Accessibility	Does Not Meet	Meets	Meets

Landowner	Approximate acres within 1/2 mi. wide corridor	% of total area within corridor
Public: BLM	1,455	53
Private:		
Willamette Ind.	704	24
Sterker Forest Ind.	261	10
Kessi	120	5
Swanson-Superior	90	4
Other private	102	4
Total	2,732	100

Reasonably Foreseeable Uses of the Land and Water Affected by Designation

Appendix 2-F of this RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in appendix 4-K.

Uses Enhanced By Designation

Designation under the segment's highest potential classification, scenic river area, would maintain or enhance visual resource protection measures. These would enhance recreational uses within the river corridor.

Designation under a scenic or recreational river area classification would result in a continuation of current management, except that the BLM's management presence would increase. This would potentially deter inappropriate activities and thus enhance recreational use in the river corridor.

Uses Foreclosed by Designation

Designation under a scenic or recreational river area classification would not lead to the foreclosure of any current or reasonably foreseeable potential uses of the land.

Uses Curtailed by Designation

Designation under a scenic river area classification would lead to VRM Class II management of BLM-administered lands in the approximately 1/2-mile wide river corridor, constraining timber harvest on those lands available for harvest.

Theoretical Hydroelectric Power Potential

The potential hydropower available from this segment of the North Fork Alsea River is approximately 6,400 kilowatts (see introduction for more information).

There are no Federal Energy Regulatory Commission applications or other proposals for dams or diversions on file for this river segment.

Effects On Outstandingly Remarkable Values (ORVs) (ORVs enhanced or maintained if the river segment were designated.)

Designation under the scenic river area classification would ensure that the scenic qualities of this river corridor would be enhanced or maintained. Forest management activities determined to have the potential to adversely impact the scenic quality of the area would be constrained. The wildlife resource within the corridor would be enhanced by designation under the scenic river area classification through scenic quality protection measures. These would enhance wildlife habitat by constraining the amount of timber harvest on those lands available for harvest.

Fish values within the corridor would be maintained by designation under the scenic river area classification.

Designation of this segment under the recreational river area classification would maintain the identified ORVs at current levels by constraining management practices that would potentially diminish any identified ORV.

ORVs Diminished if the River Segment were not Designated

The identified ORVs (scenic, fish and wildlife) of this river corridor are not expected to be diminished if designation does not occur.

How the River Segment would be Managed if not Designated

If the river segment were not added to the National Wild and Scenic Rivers System, the BLM intends to manage land and resources under its jurisdiction within the approximately 1/2-mile wide river corridor in accordance with allocations of the PA. These allocations would be OGEA and RMA. Portions of the corridor would also be managed under VRM class II restrictions to protect scenic values. Areas not under protective allocations would be managed primarily for timber harvest. Timber stands within the OGEA would not receive a final harvest and would only be entered for stand enhancement purposes to improve wildlife habitat conditions. Any timber harvest activities would only occur under special conditions.

Administering Agency

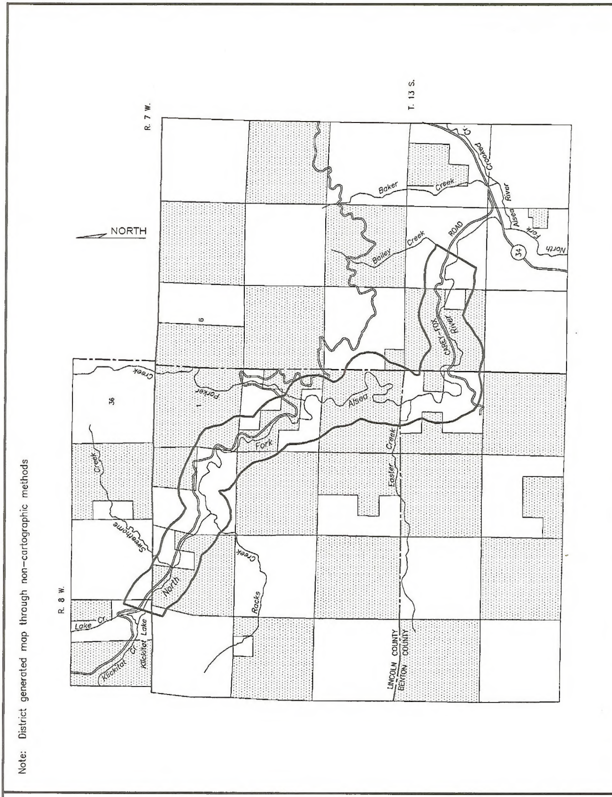
If this segment of the North Fork Alsea River were ultimately designated by Congress as a component of the National Wild and Scenic Rivers System, the BLM would be the logical managing agency.

Cost of Administration

The estimated cost of preparing a required river management plan would be $40,000. Estimated annual river management, administration, and monitoring costs would be $10,000. Cost estimates for implementing resource protection measures and developing necessary public use facilities would be determined through the river management planning process.

No state or local agency would be expected to share in the cost of future administration and management if designation occurs.

Acquisition costs to the United States associated with designation of this segment would be unlikely due to the greater than 50 percent federal control of land within the corridor.



LEGEND

Possible Wild and Scenic Management Boundary (1/4 mile each side)

Land Under Public Jurisdiction

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Salem District 1992 RMP/EIS

WILD AND SCENIC RIVER SUITABILITY ASSESSMENT

NORTH FORK ALSEA RIVER

Oregon

0 1/2 1 1 1/2 2 Miles

Wild and Scenic River Suitability Assessment South Fork Alsea River

Part I. Finding and Rationale

Finding

A 16.4-mile segment of the South Fork Alsea River from its headwaters to its confluence with Tobe Creek is found not suitable for designation as a component of the National Wild and Scenic Rivers System.

Rationale

Based on the ORV comparison of the South Fork Alsea River and other rivers in SCORP region 8, the South Fork Alsea River's only identified ORV, geology, did not rank in the top four. The level of protection provided by the Alsea Falls Recreation Site allocation would protect the identified geological ORV. The recreation site surrounding Alsea Falls would be managed exclusively for recreation. As a result, the falls would be protected from potential adverse impact. A proposed fish ladder that had the potential to affect the integrity of the falls has been rejected and no longer poses a threat to the geologic value of this river corridor.

In addition, public input regarding this segment's potential inclusion as a component of the National Wild and Scenic Rivers System has included a substantial number of responses opposing designation.

Part II. Background

Description of the River-Related Environment

The Salem District Office staff identified as eligible a 16.4-mile segment of the South Fork Alsea River from its headwaters in the BLM Eugene District to its confluence with Tobe Creek. This segment is docated in Sec. 31, T. 14 S., R. 6 W., W.M., Secs. 17, 18, 19, 20, 21, 22, 23, 25, 26, and 36 of T. 14 S., R. 7 W., W.M., Secs. 1 and 13, T. 14 S., R. 8 W., W.M. and Secs. 6, 7, and 18, T. 15 S., R. 6 W., W.M. (see map). The segment lies near the 800 foot-level on the western slope of the Coast Range about nine miles southeast of Alsea, Oregon.

The headwaters of this segment is characterized by a wide riparian zone with wetland features extending nearly three miles downstream. Much of this segment flows through dense riparian vegetation consisting of fairly young Douglas-fir and various hardwood species. Further downstream, the river carves a shallow canyon with moderately steep hillsides covered with stands of Douglas-fir of various age classes. The stream gradient is low throughout most of the segment.

Much of this segment is paralleled by a public road system that provides access for timber management and various recreation activities.

Portions of this segment of the South Fork Alsea River were identified as having moderate problems regarding water quality conditions in the 1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution. Current water quality does not affect the segment's eligibility for inclusion in the National Wild and Scenic Rivers System.

Eligibility Determination

Upon evaluation, the South Fork Alsea River was found to be free flowing within the 16.4-mile segment. One river-related resource value, geology, was determined to be outstandingly remarkable based on established eligibility criteria.

The geological resource was determined to meet the criteria for outstandingly remarkable based on the relative scarcity of significant waterfalls in this region of the Coast Range. Alsea Falls is one of the largest falls on a river of this size in the region and attracts many visitors.

Tentative Classification

The highest potential classification for this segment of the South Fork Alsea River was found to be recreational river area based on the conditions shown in the following table.

The segment is free of any impoundments or diversions. Streambank modifications are limited to bridges, culverts and riprap associated with several road crossings. Some shoreline development is present along the study segment, including the BLM Alsea Falls Recreation Site, the privately owned McBee Park, and several private residences at the segment's lower end. Forest management activities on adjacent hillsides are generally well screened from the river, but are visible in several areas along the segment. Water quality and quantity are relatively good and support the identified outstandingly remarkable value (see previous discussion of water quality in this part).

Access to this segment is via a moderately traveled, paved and unpaved road that roughly parallels much the segment. Eleven miles of the road lying adjacent to the middle portion of this segment is the BLM-administered South Fork Alsea River National Back Country Byway which attracts visitors interested in the scenic drive opportunities. The road is visible from many

Landowner	Approximate acres within 1/2 mi. wide corridor	% of total area within corridor
Public: BLM	3,005	65
Private:		
Hull-Oakes Lumber Co.	855	19
Swawnson-Superior	331	7
Starker Forest Ind.	132	3
Weyerhauser Ind.	41	1
Other Private	250	5
Total	4,614	100

Site Condition	Classification		
	Wild River Area	Scenic River Area	Recreational River Area
Water Resources Development	Meets	Meets	Meets
Shoreline Development	Does Not Meet	Does Not Meet	Meets
Water Quality	Meets	Meets	Meets
Accessibility	Does Not Meet	Does Not Meet	Meets

locations along the segment and road noise is noticeable. The primary uses of this road are for recreational access to the river corridor, access to areas being managed for timber production and as a thoroughfare connecting the Alsea Valley and State Highway 34 with the Willamette Valley and State Highway 99. People living in the Monroe/Junction City area travel this road to reach Alsea and the coast.

Public Comment

The BLM, as part of its RMP process, solicited public review and comment on the district's AMS. Public comment regarding this segment's eligibility and tentative river area classification determination was substantial. The majority of respondents did not refute the eligibility determination, but opposed the potential designation of this segment. Concerns included: fear of land use restrictions, condemnation, increased visitor use and impacts, and government interference with private citizens' rights.

Part III. Suitability Factors

Current Land Status and Use

Land Ownership

Sixty-five percent (3,005 acres) of the lands within the approximately 1/2-mile wide river corridor are administered by the BLM Salem District. The remainder of lands in the corridor are privately owned.

Land Use

Land use within the river corridor is limited primarily to timber management activities, dispersed recreation, and site-specific recreation activities at the BLM-

administered Alsea Falls Recreation Site. Overall recreational use within this river corridor is moderate relative to other rivers in the region. Most of the corridor is currently open to timber management practices. Timber on approximately 50 acres of land in the corridor has been harvested in the past 10 years.

Reasonably Foreseeable Uses of the Land and Water Affected by Designation

Appendix 2-F of this RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in appendix 4-K.

Uses Enhanced By Designation

Designation under the recreational river area classification would result in a continuation of current management, except that BLM's management presence would increase. This would potentially deter inappropriate activities and thus enhance recreational use within the river corridor.

Uses Foreclosed by Designation

Designation under the recreational river area classification would not lead to the foreclosure of any current or reasonably foreseeable potential uses of the land.

Uses Curtailed by Designation

Designation under the recreational river area classification would not curtail any current or reasonably foreseeable potential uses of the land or water.

Theoretical Hydroelectric Power Potential

The potential hydropower theoretically available from this segment of the South Fork Alsea River is approximately 6,900 kilowatts (see introduction for more information).

There are no Federal Energy Regulatory Commission applications or other proposals for dams or diversions on file for this river segment.

Effects On Outstandingly Remarkable Values (ORVs)

(ORVs enhanced or maintained if the river segment were designated.)

The geologic resource of the segment would be maintained by designation through protective measures restricting management actions that would have potential negative effects on Alsea Falls.

ORVs Diminished if the River Segment were not Designated

The geologic value of the segment would not be expected to diminish if designation does not occur.

How the River Segment would be Managed if not Designated

If the river were not added to the National Wild and Scenic Rivers System, the BLM intends to manage lands and resources under its jurisdiction within the approximately 1/2-mile wide river corridor in accordance with allocations of the PA. These allocations would be the Alsea Falls Recreation Site and an RMA. The geologic value of Alsea Falls would be protected by continued recreation site management. Portions of the corridor would also continue to be managed for timber production.

Administering Agency

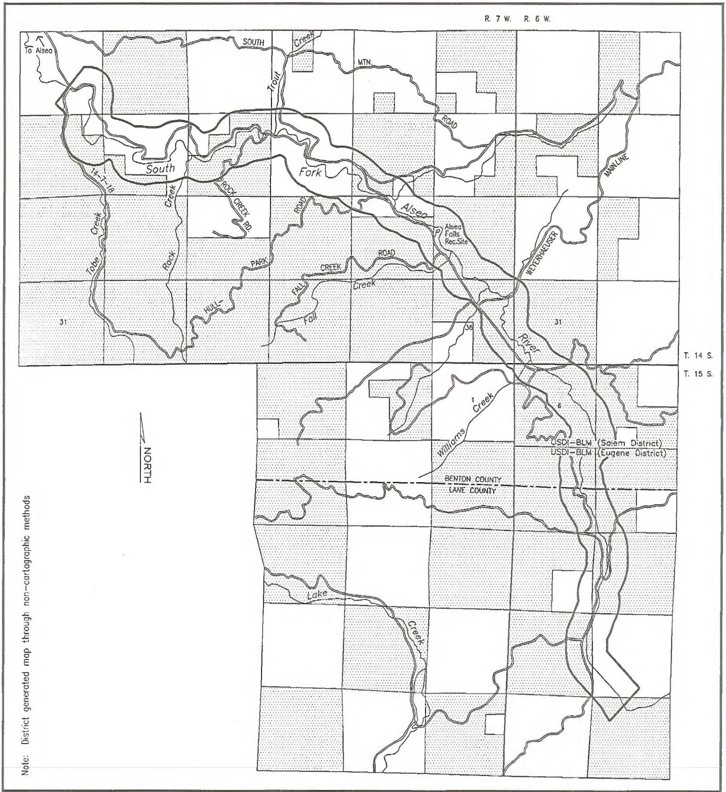
If this segment of the South Fork Alsea River were ultimately designated by Congress as a component of the National Wild and Scenic Rivers System, the BLM would be the logical managing agency.

Cost of Administration

The estimated cost of preparing a required river management plan would be $40,000. Estimated annual river management, administration, and monitoring costs would be $10,000. Cost estimates for implementing resource protection measures and developing necessary public use facilities would be determined through the river management planning process.

No state or local agency would be expected to share in the cost of future administration and management if designation occurs.

Acquisition costs to the United States would not be expected with designation of this segment due to the greater than 50 percent federal control of land within the corridor.



LEGEND

Possible Wild and Scenic Management Boundary (1/4 mile each side)

Land Under Public Jurisdiction

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Salem District 1992 RMP/EIS

WILD AND SCENIC RIVER SUITABILITY ASSESSMENT

SOUTH FORK ALSEA RIVER

Oregon

0 1/2 1 1 1/2 2 Miles

Wild and Scenic River Suitability Assessment Walker Creek

Part I. Finding and Rationale

Finding

A 2.5-mile segment of Walker Creek from its headwaters to its confluence with the Nestucca River is found not suitable for designation as a component of the National Wild and Scenic Rivers System.

Rationale

Based on the ORV comparison of Walker Creek and other rivers in SCORP region 8, Walker Creek's botanical/ecological value ranked first. Most of the botanical/ecological values for which the segment was determined to be eligible are located on privately owned lands. The Wild and Scenic Rivers Act grants no authority for management of private lands within the boundary of a designated Wild and Scenic River. Therefore, designation would not afford adequate ORV protection where needed.

In March 1992, the Oregon State Parks and Recreation Commission approved the classification of Walker Creek as a recreation river area of the Oregon Scenic Waterways Program. The land management rules set forth in the state's final river management program for Walker Creek apply to all ownerships within the scenic waterway corridor. With implementation, the river management program should protect the botanical/ ecological values for which the segment was determined eligible. The Oregon Scenic Waterways Act also prohibits dam construction within the recreation river area. There is no need to duplicate this protection.

The population of Sidalcea nelsoniana located on BLM-administered land would be protected by an ACEC. Again, duai designation is not warranted to protect the identified ORV.

Part II. Background

Description of the River-Related Environment

The Salem District Office staff identified as eligible a 2.5-mile segment of Walker Creek from its headwaters to its confluence with the Nestucca River. This segment is located in Secs. 15, 21 and 22, T. 3 S., R. 6 W., W.M. (see map). This segment lies near the 2,000 foot-level on the western slope of the Coast Range about 13 miles northwest of McMinnville, Oregon. This entire segment is currently a designated state scenic waterway.

The headwaters area of this segment flows near several clearcut units and into an area characterized by a wetland that extends nearly the entire length of the segment. Much of this segment flows through dense riparian vegetation consisting of uneven-age Douglas-fir, western hemlock and numerous hardwood tree species. The understory plant community is extremely diverse and contains populations of several unusual species including a population of the proposed threatened *Sidalcea nelsoniana*. Below the wetland, the riparian zone narrows as it enters a small canyon with moderately steep slopes extending down to the stream. The stream gradient is fairly low throughout the segment.

Access along this segment is via an unpaved road system that parallels and crosses the stream in several places. Primary uses within this corridor include scientific research and timber management activities.

This segment of Walker Creek was not identified as having any problems regarding water quality conditions in the 1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution. Current water quality does not affect the segment's eligibility for inclusion in the National Wild and Scenic Rivers System.

Eligibility Determination

Upon evaluation, Walker Creek was found to be free flowing within the 2.5-mile segment. One river-related resource value, botanical/ecological, was determined to be outstandingly remarkable based on established eligibility criteria.

The botanical/ecological ORV is based on the relative scarcity of high-elevation wetland areas of this type, and the presence of a significant population of the proposed threatened Sidalcea nelsoniana. This wetland is also occasionally used as a wetland research area for local colleges and universities.

Tentative Classification

The highest potential classification for this segment of Walker Creek was found to be recreational river area based on the conditions shown in the following table.

The segment is free of any impoundments or diversions. Streambank modifications are limited to a bridge, culverts and riprap associated with several road crossings. No shoreline development is present along the segment. Forest management activities on nearby hillsides are generally well screened from the river, but are visible in several places along the segment. Water quality and quantity are relatively good and support the identified ORV (see previous discussion of water quality in this part).

Site Condition	Classification		
	Wild River Area	Scenic River Area	Recreational River Area
Water Resources Development	Meets	Meets	Meets
Shoreline Development	Meets	Meets	Meets
Water Quality	Meets	Meets	Meets
Accessibility	Does Not Meet	Does Not Meet	Meets

Landowner	Approximate acres within 1/2 mi. wide corridor	% of total area within corridor
Public: BLM	396	54
Private: Willamette Ind. City of McMinnville	 290 50	46
Total	736	100

Access to this segment is via a lightly traveled, unpaved road system that roughly parallels much of the segment and crosses it in several locations. The road is visible from several locations along the segment although vehicular noise is not normally noticeable. The primary use of this road is for access to upstream timber management projects and wetland research areas.

Public Comment

The BLM, as part of its RMP process, solicited public review and comment on the district's AMS. Public comment regarding this segment's eligibility and tentative river area classification determination has been minimal. Several respondents voiced concern about restrictions being placed on dam construction if this segment were designated, and on the water needs of the City of McMinnville and the surrounding Willamette Valley area.

Part III. Suitability Factors

Current Land Status and Use

Land Ownership

Fifty-four percent (396 acres) of the lands within the approximately 1/2-mile wide river corridor are administered by the BLM Salem District. The remainder of lands in the corridor are privately owned.

Land Use

Current land use within the river corridor is limited primarily to timber management activities and occasional scientific study/research. Some dispersed recreation activities occur in the corridor, but overall, recreation use is very low. Most of the corridor is currently open to timber management practices. Timber on approximately 150 acres within the corridor has been harvested in the past 10 years.

Reasonably Foreseeable Uses of the Land and Water Affected by Designation

Appendix 2-F of this RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in appendix 4-K.

Uses Enhanced By Designation

Designation under the recreational river area classification would result in a continuation of current management, except that BLM's management presence would increase, potentially deterring inappropriate activities and thus enhancing scientific research/study opportunities in the river corridor.

Uses Foreclosed by Designation

Designation under the recreational river area classification would lead to the foreclosure of a dam and municipal water storage impoundment proposed by the McMinnville Water and Light Department. No other current or reasonably foreseeable potential uses of the land would be foreclosed by designation at this classification.

Uses Curtailed by Designation

Designation under the recreational river area classification would not curtail any current or reasonably foreseeable potential uses of the land or water.

Theoretical Hydroelectric Power Potential

The average annual streamflow for this segment of Walker Creek is less than 35 ft^3/sec. Based on this finding, the hydropower potential of this stream segment was not further reviewed (see introduction for more information).

There are no Federal Energy Regulatory Commission applications or other proposals for dams or diversions on file for this river segment.

Effects On Outstandingly Remarkable Values (ORVs)

(ORVs enhanced or maintained if the river segment were designated.)

The botanical/ecological value of the segment would be maintained on BLM-administered lands in the corridor if designation occurs. Protective measures restricting management actions having the potential to negatively impact this identified ORV would be implemented. Botanical/ecological values on private land would not be protected.

ORVs Diminished if the River Segment were not Designated

The botanical/ecological value of this river segment may be diminished if designation were not to occur. Much of the BLM-administered land within the corridor would be available for timber harvest. An ACEC covering BLM administered land in the wetland area is being proposed as part of this RMP and would offer some protection to the identified values. Timber harvest and other activities allowed under the State Scenic Waterways Act could still occur on private land within the corridor. This could potentially diminish the identified ORV. In addition, if the currently proposed dam were to be constructed and the planned water storage reservoir filled, much of the segment would be flooded, destroying the identified ORV.

How the River Segment would be Managed if not Designated

If the river were not added to the National Wild and Scenic Rivers System, the BLM intends to manage lands and resources under its jurisdiction within the approximately 1/2-mile wide corridor in accordance with allocations of the PA. These allocations would be the Walker Flat ACEC and an RMA. The BLM-administered lands within the designated state scenic waterway boundary would be managed in accordance with the state's final river management program for the Walker Creek Scenic Waterway. The BLM would manage these lands under VRM Class II restrictions to protect scenic values as seen from the segment. All riparian areas would be protected within an RMA. The population of Sidalcea nelsoniana located on BLM-administered lands would be protected by an ACEC allocation.

Administering Agency

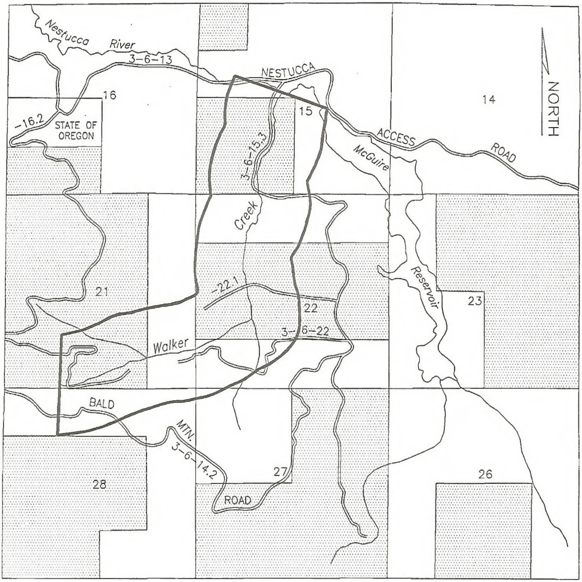
If this segment of Walker Creek were ultimately designated by Congress as a component of the National Wild and Scenic Rivers System, the BLM would be the logical managing agency.

Cost of Administration

The estimated cost of preparing a required river management plan would be $40,000. Estimated annual river management, administration, and monitoring costs would be $10,000. Cost estimates for implementing resource protection measures and developing necessary public use facilities would be determined through the river management planning process.

Although this segment is a designated state scenic waterway, it would be unlikely that other agencies would share much of the costs associated with management. Local agencies may be involved due to substantial public interest in Walker Creek's management; however, management funding from this source would be unlikely.

Acquisition costs to the United States would not be expected with designation of this segment due to the greater than 50 percent federal control of land within the corridor.



Note: District generoted mop through non-cortogrophic methods

LEGEND

Possible Wild and Scenic Management Boundary (1/4 mile each side)

Land Under Public Jurisdiction

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Salem District 1992 RMP/EIS

WILD AND SCENIC RIVER SUITABILITY ASSESSMENT

WALKER CREEK

Oregon

0 1/2 1 Miles

Wild and Scenic River Suitability Assessment Molalla River (Segment B)

Part I. Finding and Rationale

Finding

A 12.4-mile segment of the Molalla River from its confluence with the Table Rock Fork Molalla River to its confluence with the North Fork Molalla River is found suitable for designation as a component of the National Wild and Scenic Rivers System. Its tentative classification is recreational river area.

Rationale

Based on the ORV comparison of the Molalla River and other rivers in SCORP region 7, the Molalla River's recreational and geologic values ranked fourth. It's scenic value did not rank in the top four. The Molalla River is a worthy addition to the National Wild and Scenic Rivers System due to its outstandingly remarkable geologic, recreational and scenic values. Protection of the river's free flowing character cannot be ensured through current management or administration. Without designation, the river could be developed for hydropower or water resources at some point in the future, resulting in the irreversible or irretrievable loss of this resource. In addition, the Molalla River offers important local and regional recreation settings and opportunities. As the main access corridor to the BLM-administered Table Rock Wilderness, the river offers complimentary recreation opportunities and provides a natural transition from developed to primitive recreation settings. Designation of the Molalla River would enhance recreation opportunities along the river and would add greatly to the recreational values of the area and region. Maintenance and enhancement of recreational and scenic values would be less likely if the river were not designated.

Part II. Background

Description of the River

The Salem District Office staff identified as eligible a 12.4-mile segment of the Molalla River from its confluence with the Table Rock Fork Molalla River to its confluence with the North Fork Molalla River. The segment is located in Secs. 6, 7, 18, 19, 30 and 31, T. 6 S., R. 3 E., W.M., and Secs. 6, 7, 8, 15, 16 and 17, T. 7 S., R. 3 E., W.M., (see map). The segment lies near the 800-foot level on the western slope of the Cascade Range, about 11 miles southeast of Molalla, Oregon.

The segment flows through a fairly deep, moderately dissected canyon. The canyon contains many points of scenic interest, particularly near the middle portion of the segment, located in a constricted area of the canyon. Adjacent hillsides are covered with primarily mature and second-growth Douglas-fir. Near-vertical cliffs and rock outcrops descend into the river in many locations and add to the corridor's scenic value.

Access to and along this segment is via the South Molalla Road. Primary uses within the corridor include dispersed recreation and timber management activities.

The lower portion of this segment of the Molalla River was identified as having moderate problems regarding water quality conditions in the 1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution. Current water quality does not affect the segment's eligibility for inclusion as a component of the National Wild and Scenic Rivers System.

Eligibility Determination

Upon evaluation, the Molalla River was found to be free flowing within the 12.4-mile segment. Three river-related resource values (scenic, recreational, and geologic) were determined to be outstandingly remarkable based on established eligibility criteria. A description of each ORV follows:

The scenic quality of this river corridor is characterized by a wide range of colors and textures. Colors range from grays and blacks on exposed rock outcrops to greens and browns from a wide variety of vegetative types present within the viewshed. The character of the river ranges from deep clear pools to riffles and cascading whitewater. Many rock outcrops and cliffs descend directly into the river, and large boulders, covered with moss and vegetative growth, add to the scenic quality. Human influences detract slightly from the view in many areas, but the overall impact is not significant.

Recreational opportunities within this river corridor include day hiking, fishing, dispersed camping, picnicking and waterplay. This area attracts visitors originating from within and outside the region to swim and play in the water during summer weekends, and to fish for steelhead in the winter months. Ease of access and diverse opportunities add to the recreational value of this river corridor.

The geological value of this river segment is considered unique and unusual in the region. A series of horizontal columnar basalt rosettes occur near the middle of the segment, providing a regionally rare textbook example of this type of geologic feature. This feature is especially unusual because it has been exposed by the erosional processes of the river itself and can be easily interpreted and observed by visitors.

Tentative Classification

The highest potential classification for this segment of the Molalla River was found to be recreational river area based on the conditions shown in the following table.

The segment is free of any impoundments or diversions. Streambank modifications include rip-rap areas, bridges and stream channel straightening associated

with the South Molalla Road. Shoreline development along this segment includes several structures near the upper portion of the segment, and the community of Glen Avon near the segment's lower terminus. Forest management activities on nearby hillsides are visible in many areas along the segment. Water quality and quantity are relatively good and support the identified ORVs (see previous discussion of water quality in this part).

Access along this segment is via the South Molalla Road, a heavily used, paved, two-lane BLM road that roughly parallels the entire river segment. From the river, the road is visible in many places. Vehicular noise is noticeable from all but a few locations along the river. The road is primarily used for recreational access to the river corridor and for access to areas being managed for timber production.

Public Comment

The BLM, as part of its RMP process, solicited public review and comment on the district's AMS. Public comment regarding this segment's eligibility and tentative river area classification determination was minimal. Of the comments received, most were concerned with the Wild and Scenic Rivers Act and provisions of the act rather than this particular segment's eligibility or tentative classification determination.

Part III. Suitability Factors

Current Land Status and Use

Land Ownership

Eighty-four percent of the lands (3,303 acres) within the approximately 1/2-mile wide potential river corridor are administered by the BLM Salem District. The remainder of the corridor is privately owned.

Land Use

Current land use within the approximately 1/2- mile wide river corridor includes dispersed recreation and timber management activities. Timber on approximately 100 acres within the corridor has been harvested in the past 10 years.

Reasonably Foreseeable Uses of the Land and Water Affected by Designation

Appendix 2-F of this RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in appendix 4-K.

Landowner	Approximate acres within 1/2 mi. wide corridor	% of total area within corridor
Public:		
BLM	2,972	71
Forest Service	778	13
OSDF	107	3
Private:		
Timber Co.	543	11
Other Private	80	2
Total	4,484	100

Site Condition	Classification		
	Wild River Area	Scenic River Area	Recreational River Area
Water Resources Development	Meets	Meets	Meets
Shoreline Development	Does Not Meet	Meets	Meets
Water Quality	Meets	Meets	Meets
Accessibility	Does Not Meet	Does Not Meet	Meets

Uses Enhanced By Designation

Designation under the recreational river area classification would result in a continuation of current management, except that the BLM's management presence would increase. This would potentially diminish inappropriate activities and thus enhance recreational use within the river corridor. If this segment were designated, more funding may be available to improve road maintenance, to complete activity planning within the corridor, to increase management presence, and to initiate facility development and visitor interpretation.

Uses Foreclosed by Designation

Designation under the recreational river area classification would not lead to the foreclosure of any current or reasonably foreseeable potential uses of the land and water.

Uses Curtailed by Designation

Designation under the recreational river area classification would curtail timber harvest if harvest activities would reduce the overall scenic quality of the corridor to less than an outstandingly remarkable condition.

Theoretical Hydroelectric Power Potential

The potential hydropower theoretically available from this segment of the Molalla River is approximately 17,300 kilowatts (see introduction for more information).

There are no Federal Energy Regulatory Commission applications or other proposals for dams or diversions on file for this river segment.

Effects On Outstandingly Remarkable Values (ORVs)

(ORVs enhanced or maintained if the river segment were designated.)

Designation would ensure that the scenic qualities of this river corridor would be maintained. Forest management activities determined to adversely impact the scenic quality of the area would be constrained.

Recreation activities including fishing, hunting, camping, picnicking, swimming and general waterplay would be enhanced by designing timber management to protect scenic values. In addition, an increased management presence may help deter some undesirable activities associated with unregulated use, e.g., litter, vandalism, and trespass onto privately owned lands.

Designation would maintain the geological value of this river segment by ensuring that no future uses or management in this corridor would impact the outstanding geological feature associated with this segment. Designation would also provide greater opportunity for interpretation and educational study of this feature.

ORVs Diminished if the River Segment were not Designated

Scenic values would be reduced somewhat due to less restrictive measures and considerations for resource management activities. Timber harvest activity in the river corridor would potentially result in a reduction of the overall scenic quality. Somewhat less consideration would be given to scenic values in the planning and layout of timber sales within the corridor. Man-made improvements including recreational facilities and roads would be similarly less restricted.

Geologic values would be degraded or lost if quarry development activities or impoundments would occur. No effort would be made to interpret geologic values.

How the River Segment would be Managed if not Designated

If the river segment were not added to the National Wild and Scenic Rivers System, the BLM intends to manage lands and resources under its jurisdiction within the approximately 1/2-mile wide river corridor in accordance with the PA. These allocations would be OGEA, RMA, and TPCC. A small portion of the corridor falls within an OGEA and several areas fall under restrictive TPCC classifications. Nearly the entire corridor would be managed within the framework of a recreational activity plan that would emphasize recreation opportunities in the area.

Administering Agency

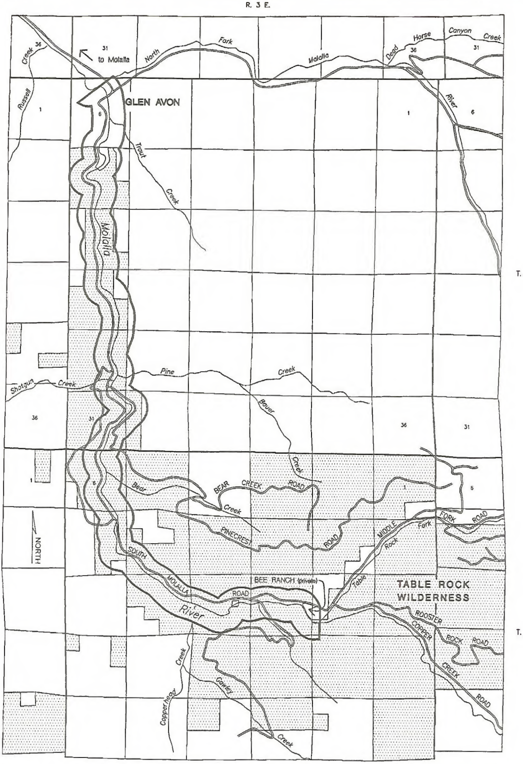
If this segment of the Molalla River were ultimately designated by Congress as a component of the National Wild and Scenic Rivers System, the BLM would be the logical managing agency.

Cost of Administration

The estimated cost of preparing a required river management plan would be $100,000. Estimated annual river management, administration, and monitoring costs would be $40,000. Cost estimates for implementing resource protection measures and developing necessary public use facilities would be determined through the river management planning process.

No state or local agency would be expected to share in the cost of future administration or management.

Acquisition costs to the United States would not be expected with designation of this segment due to the greater than 50 percent federal control of land within the corridor.



LEGEND

Possible Wild and Scenic Management Boundary (1/4 mile each side)

Land Under Public Jurisdiction

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Salem District 1992 RMP/EIS

WILD AND SCENIC RIVER SUITABILITY ASSESSMENT

MOLALLA RIVER
(Segment B)
Oregon

0 1/2 1 1 1/2 2 Miles

Wild and Scenic River Suitability Assessment Nestucca River (Segment A)

Part I. Finding and Rationale

Finding

A 15.3-mile segment of the Nestucca River from Ginger Creek to the western boundary of T. 4 S., R. 7 W., W.M. is found suitable for designation as a component of the National Wild and Scenic Rivers System. It's tentative classification is recreational river area.

Rationale

Based on the ORV comparison of the Nestucca River and other rivers in SCORP region 5, the Nestucca River's recreation and fish values ranked first and its scenic value ranked third. The highly scenic drive along the BLM-administered Nestucca River National Back Country Byway, the diversity of recreational opportunities along the corridor and the high quality fish habitat make this segment suitable for designation as a component of the National Wild and Scenic Rivers System.

It should be noted that all of the river-related values would be protected under other protective allocations.

Although the BLM received substantial public comment on the Nestucca River, most concerns pertained to the lower portion of the river (segment B) which is predominantly in private ownership. Very little opposition was expressed concerning segment A. However, this was because respondents assumed that adequate management and administration would occur concurrently with the projected increase in visitor use.

Part II. Background

Description of the River

The Salem District Office staff identified as eligible a 15.3-mile segment of the Nestucca River from its confluence with Ginger Creek to the western section line of Sec. 7, T. 4 S., R. 7 W., W.M. The segment is located in Secs. 7, 8, and 9, T. 3 S., R. 6 W., W.M., Secs. 13, 24, 26, 27, 28, 31, 32, and 33, T. 3 S., R. 7 W., W.M., and Secs. 6 and 7, T. 4 S., R. 7 W., W.M., (see map). The segment lies near the 1,200-foot level on the western slope of the Coast Range, about 20 miles southeast of Tillamook, Oregon.

The segment flows through a deep, highly dissected canyon that provides habitat for a wide variety of plant and animal species. Adjacent hillsides are covered with a patchwork of mature Douglas-fir, western hemlock, western redcedar and young plantations. Vertical cliffs and rock outcrops descend into the river in many locations and add to the scenic value of this river corridor.

Access to and along this segment is via the Nestucca Access Road. Present use within the corridor includes recreation and timber management activities.

This segment of the Nestucca River was identified as having moderate problems regarding water quality conditions in the 1988 Oregon Statewide assessment of Nonpoint Sources of Water Pollution. Current water quality does not affect the segment's eligibility for inclusion as a component of the National Wild and Scenic Rivers System.

Eligibility Determination

Upon evaluation, the Nestucca River was found to be free flowing within the 15.3-mile segment. Three river-related values (scenic, recreational, and fish) were determined to be outstandingly remarkable based on established eligibility criteria. A description of each ORV follows:

The scenic qualities of this river corridor include views of a steep, thickly vegetated Coast Range canyon exhibiting a multi-age mix of vegetation with a wide range of colors and textures. Much of the segment flows under a canopy of 200-foot tall Douglas-fir and various hardwood species. In other areas the canopy opens up to reveal hillside views. The scenic values of this river corridor have gained significance since 11 miles of the Nestucca Access Road were dedicated as the BLM-administered Nestucca River National Back Country Byway.

Recreational opportunities within this river corridor include day hiking, camping, picnicking and studying nature (botanical and wildlife observation). Four BLM recreation sites (Alder Glen, Dovre, Elk Bend, and Fan Creek) and one Forest Service campground (Rocky Bend) are located in the corridor and provide facilities for both day and overnight use. In addition to visitors traveling from within the region to participate in their preferred recreational activities, this area attracts many visitors originating from outside the region, especially those wanting to travel the national back country byway.

The fish value of this river segment is considered one of the best in the region, if not Oregon. The Nestucca River ranks among the highest in the region for the production of spring and fall chinook salmon and summer and winter steelhead. Coho salmon, chum salmon, sea-run cutthroat and resident cutthroat are also present in this segment at various times during the year. Overall fish habitat within this segment is considered very good.

Tentative Classification

The highest potential classification for this segment of the Nestucca River was found to be recreational river area based on the conditions shown in the following table.

The segment is free of any impoundments or diversions. Streambank modifications include rip-rap areas, bridges, stream channel straightening associated with the Nestucca Access Road, and fish habitat enhancement structures. Shoreline development includes the four developed BLM recreation sites, the Forest Service's campground, and several private residences. Forest management activities on adjacent hillsides are generally well screened from the river, but are visible from some areas along the segment. Water quality and quantity are relatively good and support the identified ORVs (see previous n of water quality in this part).

Access to and along this segment is via the Nestucca Access Road, a well traveled, paved road that roughly parallels the entire river segment. From the river, the access road is generally well screened, but is still visible in many places. Vehicular noise is noticeable from all but a few locations along the river. The primary uses of this road are for transportation between the Willamette Valley and the Oregon coast, for recreational access to the river corridor, and for access to areas managed for timber production.

Public Comment

The BLM, as part of its RMP process, solicited public review and comment on the district's AMS. Public comment regarding this segment's eligibility and tentative river area classification determination was substantial. The majority of respondents did not refute the eligibility determination, but opposed the potential designation of this segment. Concerns included: fear of land use restrictions, condemnation, increased visitor use and impacts, and government interference with private citizens' rights.

Part III. Suitability Factors

Current Land Status and Use

Land Ownership

Seventy-two percent of lands (2,972 acres) within the approximately 1/2-mile wide river corridor are administered by BLM Salem District. The remainder of the corridor is administered by the Forest Service, OSDF, or is privately owned.

Land Use

Current land use within the approximately 1/2-mile wide river corridor includes dispersed and site-oriented recreation activities and timber harvest. Overall recreation use within the corridor is heavy and includes a wide range of activities. Timber production from lands within the corridor is also fairly high. In the past 10 years, timber on approximately 640 acres within the corridor has been harvested.

Reasonably Foreseeable Uses of the Land and Water Affected by Designation

Site Condition	Classification		
	Wild River Area	Scenic River Area	Recreational River Area
Water Resources Development	Meets	Meets	Meets
Shoreline Development	Does Not Meet	Does Not Meet	Meets
Water Quality	Meets	Meets	Meets
Accessibility	Does Not Meet	Does Not Meet	Meets

Landowner	Approximate acres within 1/2 mi. wide corridor	% of total area within corridor
Public: BLM	3,303	84
Private: Cavenham Forest Ind. Other Private	 626 5	 16
Total	3,934	100

Appendix 2-F of this RMP/EIS provides a general description of land uses and management practices appropriate for wild, scenic, and recreational river areas. Consequences by plan alternative are displayed in appendix 4-K.

Uses Maintained or Enhanced By Designation

Designation under the recreational river area classification would result in a continuation of current management, except that BLM's management presence would increase. This would potentially deter inappropriate activities and thus enhance recreational use within the river corridor. In addition, if the segment were designated, more funding may be available to improve maintenance of the existing access road, to complete activity planning within the corridor, and to initiate any planned facility development and visitor interpretation.

Uses Foreclosed by Designation

Designation under the recreational river area classification would not lead to the foreclosure of any current or reasonably foreseeable potential uses of the land or water.

Uses Curtailed by Designation

Designation under the recreational river area classification would not curtail any current or reasonably foreseeable potential uses of the land or water.

Theoretical Hydroelectric Power Potential

The potential hydropower available from this segment of the Nestucca River is approximately 12,500 kilowatts (see introduction for more information).

There are no Federal Energy Regulatory Commission applications or other proposals for dams or diversions on file for this river segment.

Effects On Outstandingly Remarkable Values (ORVs)

(ORVs enhanced or maintained if the river segment were designated.)

Designation would ensure that the scenic qualities of this river corridor would be maintained. Forest management activities that are determined to have the potential to adversely impact the scenic quality of the area would be constrained.

Recreation activities including studying nature (botanical and wildlife observation), pleasure driving and day hiking would be enhanced by designation through the direct benefits of timber management constraints to protect the scenic value. In addition, an increased management presence may deter some undesirable activities associated with unregulated use, e.g., litter, vandalism, and trespass onto privately owned lands.

Designation would maintain and potentially enhance the fish value of this segment through an anticipated increase in funding for fish habitat and riparian area management.

ORVs Diminished if the River Segment were not Designated

Identified ORVs would not be diminished if designation does not occur. The river-related values would be protected under other protective allocations.

How the River Segment would be Managed if not Designated

If the river were not added to the National Wild and Scenic Rivers System, the BLM intends to manage lands and resources under its jurisdiction within the approximately 1/2-mile wide corridor in accordance with allocations of the PA. These allocations would be OGEA, Nestucca River ACEC and an RMA.

In March 1992, the Oregon State Parks and Recreation Commission approved the classification of the Nestucca River as a recreation river area (in part) and a scenic river area (in part) through the Oregon Scenic Waterways Program. The land management rules set forth in the state's final river management program for the Nestucca River apply to all ownerships within the scenic waterway corridor. With implementation, the river management program should protect the river-related values for which the segment was determined eligible. The Oregon Scenic Waterways Act also prohibits dam construction within the boundaries of the scenic waterway corridor.

In addition, the BLM-administered lands along this segment would be managed as an ACEC under an existing ACEC management plan. All identified ORVs would be protected under this plan. Portions of the river corridor would also be managed as an RMA. The river-related ORVs would be maintained or enhanced through RMA management even without the ACEC allocation or state scenic waterway designation.

Administering Agency

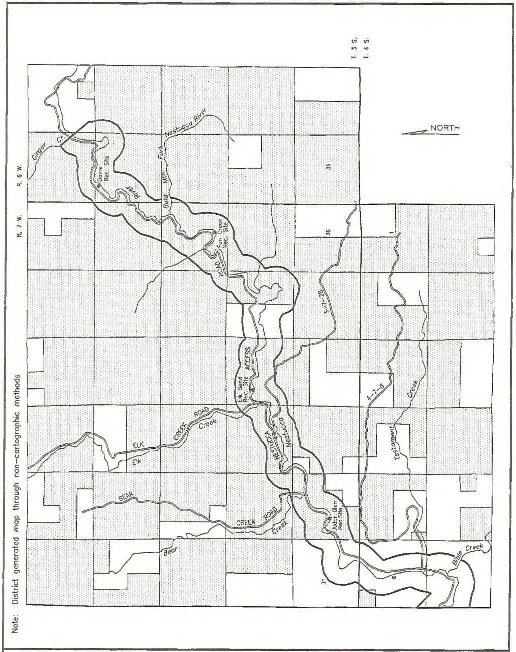
If this segment of the Nestucca River were designated by Congress as a component of the National Wild and Scenic Rivers System, the BLM would be the logical managing agency.

Cost of Administration

The estimated cost of preparing a required river management plan would be $75,000. Estimated annual river management, administration, and monitoring costs would be $40,000. Cost estimates for implementing resource protection measures and developing necessary public use facilities would be determined through the river management planning process.

Although this segment is a designated state scenic waterway, it would be unlikely that other agencies would share much of the costs associated with management. Local agencies may also be involved due to substantial public interest in the Nestucca River's management; however, management funding from this source would be unlikely.

Acquisition costs to the United States associated with designation of this segment would be unlikely due to the greater than 50 percent federal control of land within the corridor.



LEGEND

Possible Wild and Scenic Management Boundary (1/4 mile each side)

Land Under Public Jurisdiction

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
Salem District 1992 RMP/EIS

WILD AND SCENIC RIVER SUITABILITY ASSESSMENT

NESTUCCA RIVER

Oregon

0 1/2 1 1 1/2 2 Miles

Appendix 2-M
Goal and Objectives of the Preferred Alternative

Goal

Emphasize ecosystem management.

Manage lands to contribute to community stability consistent with maintenance of ecosystems and a diversity of species; contribute to long-term recovery of the northern spotted owl; and maintain fish and wildlife habitat, and recreation, scenic, and other resources.

Objectives

Produce a moderate sustained yield of timber.

Manage biological diversity and contribute to recovery of the spotted owl using a system that maintains and enhances old-growth and mature forest in areas considered most important for recovery of the spotted owl and provides connectivity between those areas where possible. Provide subregional connectivity to designated conservation areas on national forests where possible.

Protect habitats of listed threatened and endangered species and those with a high potential for listing. Manage species of related concern to maintain their populations at a level which would avoid contributing to the need to list such species.

Retain existing RNAs and most ACECs. Retain other special areas. Provide new special areas where needed to maintain or protect important values.

Manage scenic resources in selected high-use and high-value areas.

Provide substantial protection for anadromous fish habitat, other perennial streams, and other water environments.

Provide for a wide range of developed and dispersed recreation opportunities, consistent with maintenance of ecosystems and a diversity of species, to minimize conflicts among recreation user groups.

Find important and manageable river segments suitable for designation to the classification for which they are eligible, where such designation would make a significant contribution to the national wild and scenic river system.

Make land tenure adjustments to benefit a variety of uses and values.

Consider appropriate special forest management practices on BLM-administered lands in rural interface areas and in other forest residential areas.

Appendix 2-N District Acreage Summary by Alternative

	A	B	C	D	E	PA
Commercial Forest Land						
Intensive or general forest management area	311,000	264,900	0	0	132,700	100,300
Restricted						
VRM II	0	2,100	0	27,700	22,900	15,800
High retention areas	0	0	159,500	0	0	0
Low retention areas	0	0	79,100	0	0	0
50-11-40	0	0	0	125,400	0	0
Rural residential areas	0	0	0	8,700	18,500	0
Connectivity areas	0	0	0	0	0	33,300
Enhancement of other uses or unavailable						
Seral stage blocks	0	36,400	0	0	0	0
R&R blocks	0	0	50,200	0	0	0
Habitat conservation areas				110,300		
150 years + with buffers	0	0	0	0	54,000	0
Spotted owl areas	0	0	0	0	8,600	0
40-acre blocks	0	0	0	0	400	0
Old-growth emphasis areas	0	0	0	0	0	134,200
Unavailable[1]	18,300	25,900	40,500	57,200	92,200	45,700
Noncommercial Forest Land						
Nonsuitable woodland	35,600	35,600	35,600	35,600	35,600	35,600
Nonforest Land	22,700	22,700	22,700	22,700	22,700	22,700
Unclassified						
Table Rock Wilderness	6,000	6,000	6,000	6,000	6,000	6,000
Total District Lands	393,600	393,600	393,600	393,600	393,600	393,600

[1]Unavailable includes RMAs, recreation sites/areas, special areas, T&E species sites, fragile nonsuitable sites, etc.

Appendix 3

Appendix 3-A
Land Classifications

Type of Classification	Location	Acres	Purpose and Serial No.	Name
R&PP[1]	T 9 S., R. 4 W., Sec. 14 & 23	61.4	County Park Polk County (OR 36110)	Wells Island
R&PP	T. 3 N., R. 1 W., Sec. 9	1.2	County Park Columbia County (OR 7285)[2]	J.J. Collins Mem. Park
R&PP	T. 8 S., R. 1 E., Sec. 3	200	State Park State of Oregon (OR 27240)	Silver Falls
R&PP	T. 8 S., R. 1 E., Sec. 35	44	State Park State of Oregon (OR 34517)	Silver Falls
	T. 8 S., R. 2 E., Sec. 31			
R&PP	T. 2 N., R. 2 W., Sec. 15	1.3	Fire Station Multnomah County (OR 36110)	—
R&PP	T. 11 S., R. 3 E., Sec. 25, 26, 35	459.2	Rec. Area Linn County (OR 36783)	Quartzville Creek
	T. 12 S., R. 3 E., Sec. 2, 3, 10			
R&PP	T. 4 N., R. 3 W., Sec. 7	7.6	County Park Columbia County (OR 41597)	Scaponia
R&PP	T. 1 S., R. 5 E. Sec. 3	3.4	Water Treatment Plant Corbett Water District (OR 41744)	Corbett
R&PP	T. 1 S., R. 4 E. Sec. 11, 15	280	County Park Multnomah County (OR 10366)	Oxbow
R&PP	T. 9 S., R. 2 E. Sec. 9	10	County Park Marion County (OR 11999)	L. North Fork

[1] Recreation and Public Purposes Lease
[2] Expires 5/26/96
Source: District realty records

Appendix 3-B
Summary of Water Resources Basic Principles

Water Quantity

Precipitation

Oregon's latitude, topography, and proximity to the Pacific Ocean have a great influence upon its climate. The Coast Range and Cascade Mountains play a major role in rainfall patterns. As moisture-laden air travels inland from the ocean, it ascends to cross the mountains. As it rises, the moisture cools and condenses, falling as rain or snow. Large accumulations of snow occur during winter months in the higher elevations, generally above 3,000 feet.

Precipitation is an important climatic variable that influences the productivity and management of forest lands. Estimates of precipitation are used for planning forest management activities such as the location, design and maintenance of forest roads, and the selection and scheduling of harvesting and reforestation systems.

Interception occurs when rain or snow falls on vegetation rather than the ground. Some of this intercepted water evaporates, and the remainder falls to the ground. Evaporation of water also occurs from surfaces of water bodies and soil surfaces. Under forested conditions, evaporation from soil surfaces is minimal. The process by which water is taken up by plants and discharged to the atmosphere is known as transpiration.

Infiltration is the movement of water into the soil surface. When the rainfall rate exceeds the rate of infiltration, water will travel over the ground surface to a channel. This is known as overland flow. Infiltration rates usually exceed the maximum rates of rainfall in undisturbed forest soils in western Oregon. This allows most water reaching the earth's surface to enter the soil.

Infiltration rates are reduced by soil disturbing activities such as road building and tractor logging. These activities tend to compact the soil surface. This causes some water to flow overland until it reaches nearby undisturbed soils or a stream channel.

Removal of forest vegetation drastically reduces the amount of precipitation that returns to the atmosphere as a result of interception and transpiration. This allows more precipitation to reach the soil surface and drain into streams or become ground water. The return of vegetation results in annual streamflows decreasing to preharvest levels as interception and transpiration increase. Evaporation from the soil surface is generally increased after timber harvest; however, this increase is greatly offset by the reduction in transpiration.

Streamflow

The amount of water draining from a given area in a year is referred to as the annual water yield and is usually expressed in acre-feet or the average depth over an area in inches. The annual yield of an area can be converted to the average annual flow (in cubic feet per second (CFS)) of the stream draining the area.

Streamflow is the water that reaches the stream channel. Total streamflow is a product of all the other processes in the hydrologic cycle. Distribution of annual streamflow in western Oregon is closely related to the distribution of annual precipitation. Thus high flows are observed during the winter and low flows are predominant in the summer.

The effect of timber management activities on streamflow in small headwater basins is primarily related to removal of forest vegetation and disturbance of the natural soil surface. Removing forest vegetation reduces evapotranspiration, thereby increasing the amount of rainfall available for streamflow. Studies of small watersheds in western Oregon showed that annual water yields from clearcut areas increased 26 to 43 percent following harvest.

The amount of increase in streamflow resulting from removal of forest vegetation is proportional to the type of harvest, the area harvested within a specific watershed, and the time since harvest. Stream flow increases are most noticeable in small watersheds that have large areas of vegetation removed over a short time. Stream flow increases in large basins tend to be masked because the nonvegetated area is small relative to the size of the basin.

The duration of increased water yield is not easily predicted; however, 27 years is required for water yield increases to disappear. Increases in streamflow due to vegetation removal are not distributed evenly throughout the year. Increases in summer flows appear large when compared to the naturally low levels of streamflow during the summer months. The increases in summer streamflow result from greatly reduced transpiration allowing more water to drain through the soil to the streams. Summer increases are relatively short lived because of the rapid growth of vegetation along stream channels.

Increases in streamflow following timber removal are greatest in fall because soil moisture content on the harvested areas is higher than it was under forested conditions. Therefore, a smaller amount of fall rains is used for soil moisture recharge and a larger proportion becomes streamflow. Timber removal has little effect on the size of large peak flows, which cause extensive downstream flooding. Large peak flows are caused by such great amounts of precipitation that differences in soil moisture content between harvested and forested areas become insignificant; both areas respond nearly the same.

Soil disturbance may have an influence on the frequency and magnitude of small and large peak flows. The degree of influence depends upon the amount of area compacted by roads and the proximity of the compacted area to stream channels.

Recent watershed studies have shown that timber harvest in the transient snow zone has increased the magnitude of peak flows. The transient snow zone is located at elevations where the snow level fluctuates throughout the winter in response to alternating warm and cold fronts. In the Salem District, the transient snow zone has been observed between elevations of 1,000 and 4,000 feet. Snow accumulation is greater in clearcut openings than in undisturbed forest. Rain-on-snow events result in rapid melting of these shallow snowpacks. More snowmelt is generated from clearcut openings than from forested areas, resulting in larger peak flows.

Stream flow does not always increase following the removal of vegetation. In some areas, reduced fog interception and drip following logging reduces annual precipitation enough to offset expected reductions in transpiration. In coastal areas, fog drip may account for as much as 30 percent of the water reaching the forest floor; thus, removal of forest vegetation may actually decrease annual streamflow (Harr 1983b).

Water Quality

Stream temperature, turbidity, sediment, dissolved oxygen, and chemical water quality are important water quality parameters to observe, since they indicate the ability to protect those beneficial uses listed in the Oregon Administrative Rules (OAR), chapter 340-41.

Streams flowing from undisturbed forests generally have excellent quality. This characteristic makes streams valuable for domestic water supply, fish production, and recreation. Natural processes such as surface erosion, landslides and flood events can increase sediments in stream channels, causing a detrimental effect on water quality.

Sediment and water temperature are the two water quality factors influenced most by timber harvest and road construction.

Stream Temperature

Timber harvest affects stream temperature by removing shading vegetation from streambanks. Stream temperature increases of 10> F or more have been recorded following removal of streamside vegetation by clear cutting and burning in the Oregon Cascades and Coast Range (Brown and Krygier 1970; Levno and Rothacher 1969). Because downstream shading does not significantly lower temperatures of streams warmed by upstream exposure (Brown1970), water temperatures of larger streams can also increase when small tributaries are exposed by clearcutting. The magnitude of this effect is dependent on the temperature and quantity of ground water inflow and inflow from other well shaded tributaries. The primary concern with water temperature increases is the potential for detrimental effects on fish and other aquatic organisms.

Chapter 340 of the OAR sets criteria for water temperature in streams. These criteria require no measurable increases when stream temperatures are 58° F or greater, and in no case may the increase in water temperature be more than 2° F. For application of the standards, maximum summer stream temperatures may be estimated with an equation developed by Schloss (1985). Temperature increases from removal of shading vegetation may be estimated from an equation developed by Brown (1970). Recent computer models may be used to estimate both ambient stream temperatures and changes resulting from management for individual stream reaches and networks of streams.

Sediment

The larger peak flows described above have a direct relationship to increases in the amount of sediment transported downstream. Peak flows may result in streambank erosion and scouring of channel beds. Forestry practices may also influence the sediment entering streams by surface erosion or landslides. The occurrence of surface erosion or landslides resulting from forest management activities is dependent on natural rates of surface erosion and landslide frequency, climatic factors and the type of activity. Landslide prone areas are avoided if possible in timber harvest and road construction. Roads continue to be a major source of stream sedimentation, although improved methods for design, location, construction and resurfacing of dirt road with rock over the past 10 years have greatly reduced the amount of sediment contributed by roads.

Sediment can cloud water, choke fish gills, blanket fish spawning areas, and smother bottom aquatic habitats. Sediment also increases the cost of treating drinking water. Chemicals, such as pesticides and nutrients, often bind to sediment particles. Soil erosion is the main source of sediment in water. Some soil is eroded naturally through weathering processes of rain and wind. But the main causes of soil loss are agricultural practices, timber harvesting, road and building site construction, and mining activities.

Timber management (road construction, timber harvest, and slash disposal) and other ground-disturbing activities can affect sediment levels in streams by increasing the capacity of the streams to entrain and transport sediment and by increasing the supply of sediment available for transport. Forestry-related sediment problems can be reduced through careful location of logging roads and stream crossings, installing culverts to carry runoff, tilling skid trails and landings, and providing wide setbacks (buffer zones) from streams when timber is harvested.

Construction and mining activities typically disturb large tracts of land, which contribute to sediment problems.

Instream sediment levels are transport (flow) and supply dependent. Paustian and Beschta (1979), Van Sickle and Beschta (1983) and Jackson and Beschta (1982) described bedload transport in terms of supply of material available for transport at various levels of flow. They found that most bedload transport occurred during short periods of high water, when flows were sufficient to entrain coarse, armoring riffle sediments and access supplies of finer material within the riffle. Subsequent studies (Jackson and Beschta 1984) have demonstrated that increased amounts of sand in transport can cause previously stable, coarse riffle sediments to undergo scour.

This data reveals the effects of management activities on sediment transport are directly related to the effects on high flow events. The result of increased high flow events would be increased sediment concentrations and more frequent episodes of riffle scour and fill.

The effect of management activities on the supply of sediment available for transport depends on the average slope of the contributing area and the type of erosion processes dominant in the area of the activity. On gently sloping topography with competent bedrock, little, if any, increased erosion would be expected (Fredriksen and Harr 1979). On steeper slopes, surface erosion occurs, especially after prescribed burning. It is not known how much of this eroded material reaches streams and becomes sediment. In areas where debris avalanching is the dominant erosion process, clearcutting has increased the natural rate of avalanching two to four times. Road building can increase the natural rate of erosion as much as 25 to 340 times (Fredriksen and Harr 1979). They also reported that mean annual suspended sediment concentration in a clearcut watershed, without roads, was about nine times the natural concentration (in an undisturbed forest). Mean annual sediment concentration in a patch cut watershed, with roads, was about 23 times the natural concentration. Roads sometimes contribute to increased sediment concentrations because of erosion from the road surface, cut slopes, and fill material. Road construction can increase erosion as much as 250 times in the first storms after construction, but concentrations usually drop off within a few months to two years (Brown 1983). More extended periods of sediment increase may be associated with heavy truck road use during very wet weather, on poorly surfaced roads, or with unauthorized off-road vehicles (ORV) use. Compacted soils (from roads, skid trails, or heavy equipment use) can cause gully erosion and locally large increases of sediment.

Nutrients

Nutrients enter water mainly from treated municipal sewage discharges, failing septic tank systems, and from fertilizers washed into the water by rain or irrigation. Excessive amounts of nutrients released into slow-moving waters during spring and summer can create growths of alga and aquatic weeds. Algae blooms reduce the amount of oxygen available to fish, which can cause fish kills.

To address this problem of algae growth, the Oregon Environmental Quality Commission (OEQC) adopted a chlorophyll standard. The amount of chlorophyll in water indicates the amount of aquatic plant growth. Waters violating this standard will be studied to determine the nutrient sources and options for controlling the problem. Maintaining or restoring the quality of the Salem District's more heavily used lakes is also an important issue. Lakes undergo a natural aging process, which can be accelerated by human activities. Improper agricultural, forestry, and other land use practices cause soil erosion that can introduce sediment and nutrients into the lake.

Sediment from soil erosion can rapidly fill a lake or reservoir, while nutrients increase the frequency of algal blooms and accelerate aquatic weed growth.

Shallow, nutrient-rich lakes often have impaired recreational and aesthetic values. This is especially true for lakes that are old in their stage of development. This means they have high nutrient levels and are naturally more marshlike.

Timber Harvest and Slash Disposal

Timber harvest and slash disposal can affect the chemical quality of surface water. In one Oregon Cascades watershed following prescribed burning, instream concentrations of ammonia-nitrogen and manganese reached peak levels of 7.6 and 0.44 mg/l, respectively (Fredriksen 1971). Fredriksen attributed the high concentrations of ammonia-nitrogen and manganese to burned slash in stream channels.

The aerial application of herbicides is another management activity that can affect the chemical water quality of streams. A detailed discussion of potential water quality impacts of herbicides proposed for use by the BLM is beyond the scope of this analysis. However the reader may refer to the final environmental impact statement (FEIS) for the *Western Oregon Program for the Management of Competing Vegetation* (USDI, BLM 1988d).

Application of nitrogen fertilizers also affects the chemical water quality of streams. Nitrogen is usually added to the soil by aerial application of urea pellets. Since direct fertilizer application is the major pathway for urea entry to streams, urea concentrations usually peak within one to two days following fertilizer treatment. Ammonia nitrogen, a hydrolysis product of urea, also usually peaks shortly after treatment, since it is derived from urea entering the stream.

Ammonia nitrogen in the soil is held very tightly. Only nitrate nitrogen is readily leached from the soil. This usually occurs after the ammonia is oxidized to nitrate during the warm growing season. For this reason, peak nitrate concentrations are often recorded one to two years after fertilization. However, if nitrogen fertilizer is applied shortly after an area has burned, the warm soil temperatures may enhance nitrification and subsequent leaching of nitrate into the stream. Moore (1975) summarized several water quality monitoring studies of forest fertilization with urea throughout the Pacific Northwest. He found maximum recorded nitrate values were usually less than 1mg/l and in all cases were less than 5 mg/l.

Stream Categorization

Streams are characterized by their order. Headwater stream channels are designated first order; two first order streams combine to form a second order stream. Two third order streams combine to form a third order, and so forth.

In western Oregon, first and second order streams constitute 79 percent of the total stream mileage (Boehne and House 1983). Such streams rise in very small watersheds with limited water storage capacity. These streams may have only scanty or intermittent flow during the dry season. During high flows they may move large amounts of sediment and woody debris. Headwater streams mainly determine the type and quality of downstream fish habitat.

First and second order streams are influenced by the geomorphology, soils, and vegetation of their channels. Many of these streams flow continuously. Large woody debris may cover as much as 50 percent of the channel (Swanson and Lienkaemper 1978). The stream is continuously shaded by vegetation. Flow energy in the channel is continually dissipated by woody material and vegetation. This slows erosion and deposits organic and inorganic materials. The average gradient of these streams often exceeds 10 percent, but the channels usually have a stair step configuration of flat reaches connected by riffles and low falls. Salmonid reproduction may be sufficient, even in some ephemeral streams, to furnish fry to larger waters downstream.

Third and fourth order streams usually flow continuously. The average gradient is less than five percent, but there may be intermittent stretches of rapids or falls. Woody debris usually covers less than 25 percent of the channel. High flows may flush woody material from the system or deposit it in debris jams. The vegetative canopy over third and fourth order streams varies in density. These streams can transport large

amounts of sediments. These are often deposited around channel obstructions, in narrow, winding areas or in other areas of low velocity, such as accretion bars, estuaries, and the flood plain.

The direct influence of riparian areas is moderated in fifth order and larger streams but remains important. Canopies of large, old-growth trees provide some shade. Vegetated riparian zones keep the main channel confined. The largest stems of down trees that remain in the stream provide important summer and winter salmonid habitat. Flood plains of the larger streams contain complex arrays of side channels, overflow channels, and isolated pools. Side channels are often created and maintained by large woody debris (Bisson et al.1987; Sedell et al.1984). The gradient in large streams is usually less than one percent, but rapids and falls may occur. Alluvial material and woody debris may be deposited in quiet areas, but accumulations are flushed and rearranged during high flows.

Riparian Areas

Riparian areas are critical to the regulation of streamflow and to water quality protection (see the riparian sections of chapters 3 and 4 for a discussion of riparian conditions and impacts).

Geomorphic and Hydrologic Function

Stream riparian areas have important geomorphic and hydrologic roles that support their high level of biological productivity. The most productive stream riparian areas are often associated with alluvial stream systems. That is, they are deposition zones and occur in fluvial sediments transported and reworked by the stream. A major role of the riparian area is to function as a flood plain and dissipate stream energies associated with high flows. This, in turn, permits sediments to deposit and continue development of the alluvial valley floor.

Alluvial riparian areas also function as shallow aquifers that recharge at high flows and drain at low flows. This interaction between surface flows and ground water storage creates moderated high flows and enhanced or prolonged base flows. The shallow aquifer condition also creates the moist soil conditions required for plant growth, which characterize riparian areas.

It is the geomorphic and hydrologic characteristics of riparian areas that establish the basic components of biological habitat. This includes wet soils and instream structural features such as pools, riffles, gravels and stream banks. The vegetation that thrives in riparian areas, in turn, contributes to their proper geomorphic and hydrologic functioning. Disruption of normal geomorphic or hydrologic function, or the vegetation on which it depends, usually impairs overall riparian resource values.

Geomorphic structure, such as pools and flood plains, strongly influence stream and riparian ecosystems. This is particularly true in steep, mountain valley floors typical of the Coast Range and west slope of the Cascades. Floods and debris flows can damage riparian vegetation and alter aquatic habitat.

Subterranean invertebrates thrive in a maze of underground channels that flow among the gravels, sands and rock that underlie many streams and rivers. These underground waterways can be as deep as 30 feet and can extend sideways for miles from the stream channel.

In this understream area, called the hyporheic zone, many types of small blind shrimp, primitive worms, bacteria, algae and various kinds of immature insects live. These underground animals support a food chain that extends to the surface. The hyporheic zone serves as a refuge for creatures during times of drought or stress. After floods, streams may rely on the life underground to assist in repopulation of aquatic invertebrates. The underground system is rich in bacteria that fix nitrogen, which is in great demand by surface organisms.

Ground Water

Water that infiltrates the soil surface is known as ground water. Most ground water eventually discharges into stream channels. Ground water is found in layers called aquifers. These are water bearing rocks or sediments that occur from a few feet to several hundred feet below the soil surface. Aquifers are unconfined and confined. Unconfined aquifers are also known as water table aquifers. They are generally shallow with an impermeable layer of rock or soil defining the lower boundary and the water table (saturated zone) located between the impermeable layer and land surface. These shallow, unconfined aquifers are prone to contamination from surface pollutants. Confined aquifers, also known as artesian aquifers, are very deep below the soil surface. They are separated from the surface by an impermeable layer of rock or soil. The quality of water in confined aquifers is generally excellent. However, in some cases, chemicals in the subsurface geologic formations can add undesirable contaminants, such as arsenic boron or sodium.

Ground water is replenished by rain and snow, which filters through soil and geologic formations. This underground water generally moves slowly from mountains and uplands to lowlands and valleys. There it is discharged into creeks, rivers, and marshes. Ground water dischargers to surface waters provide the base flow for streams throughout Oregon. This discharge may vary significantly in different areas, depending on the nature of the aquifer.

Water tables generally rise after removal of vegetation due to increased water recharging ground water areas. However, reductions in ground water may occur when subsurface flow is intercepted by road cuts and transformed into surface water through a ditch-culvert system. Some of this water is deposited on undisturbed areas where it returns to subsurface flow. The remainder is deposited into channels where it becomes streamflow.

Appendix 3-C
Beneficial Uses Within the Planning Area by Basin and Analytical Watershed

Appendix 3-C Beneficial Uses Within the Planning Area by Basin and Analytical Watershed

State Planning Basin USGS Hydrologic Unit Major Watershed Subwatershed	Municipal Domestic Water	Private Domestic Water	Industrial Water Supply	Irrigation	Livestock Watering	Anadromous Fish Passage	Salmonid Fish Rearing	Salmonid Fish Spawning	Resident Fish and Aquatic Life	Wildlife and Hunting	Fishing	Boating	Water Contact Recreation	Aesthetic Quality	Hydro Power	Commercial Navigation and Transportation
Willamette Basin																
Upper Willamette	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Muddy Creek	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Marys River	X	X	X	X	X	X	Y	Y	X	X	X	X	X	X		
Luckiamute R	X	X	X	X	X	Y	Y	Y	Y	X	X	X	X	X		
Pedee Creek		X		X	X				Y	X	X		X	X		
Upper Luckiamute R		X	X	X	X	Y	Y	X	X	X	X		X	X		
Little Luckiamute R	X	X		X	X	Y	Y	Y	X	X	X		X	X		
North Santiam	Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	X	X
Little N Fk Santiam		X	X	X	X	X	Y	Y	Y	Y	Y	Y	Y	X		
North Santiam River	Y	X	X	X	X											X
N Santiam Frontal	Y	X	X	X	X	X	Y	Y	Y	X	Y	Y	Y	Y	X	X
South Santiam	Y	X	X	X	X	X	Y	Y	Y	X	X	X	X	X	X	X
Upper South Santiam	Y	X	X	X	X	Y	Y	Y	Y	X	Y	Y	Y	Y	X	X
Middle Santiam River	Y	X	X	X	X	Y	X	X	X	X	X	X	X	X		
Quartzville Creek		X	X			Y	Y	Y	Y	X	Y	Y	Y	Y		
Lower Middle Santiam	Y	X	X	X	X	X	Y	Y	Y	X	X	X	X	Y		X
Hamilton McDowell	X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	X		
Crabtree Creek	X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	X		
Thomas Creek		X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Middle Willamette	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rickreall Creek	Y	X	X	X	X	Y	Y	Y	X	X	X		X	X		
Upper Rickreall Ck	Y					Y	Y	Y	X	X	X		X	X		
Lower Rickreall Ck	Y	X	X	X	X	Y	Y	Y	Y	X	X		X	Y		
Abernathy Creek																
Abernathy Creek	X	X	X	X	X	Y	X	X	X	X	X		X	X		
Yamhill																
Upper South Yamhill	Y	X	X	X	X	X	Y	Y	X	X	X	X	X	X		
Rock Creek (Yamhill)	X	X	X	X	X				X	X	X		X	X		
Rowell-Gold Creek		X		X	X				X	x	x		X	X		

Appendix 3-C Beneficial Uses Within the Planning Area by Basin and Analytical Watershed (cont.)

State Planning Basin / USGS Hydrologic Unit / Major Watershed / Subwatershed	Municipal Domestic Water	Private Domestic Water	Industrial Water Supply	Irrigation	Livestock Watering	Anadromous Fish Passage	Salmonid Fish Rearing	Salmonid Fish Spawning	Resident Fish and Aquatic Life	Wildlife and Hunting	Fishing	Boating	Water Contact Recreation	Aesthetic Quality	Hydro Power	Commercial Navigation and Transportation
Willamina Creek																
Upper Willamina						Y	Y	Y	X	X	X		X	Y		
Coast Creek	X		X	X	X	Y	Y	X	X	X		X	Y			
Willamina Frontal	Y	X	X	X	X	X	Y	Y	X	X	X		X	Y		X
South Yamhill River																X
Deer Creek		X		Y	X	Y	Y	Y	X	X	X		X	X		
Mill Creek		X		X	X	Y	Y	Y	X	X	X		X	X		
Gooseneck Creek	X	X	X	X	X				Y	Y	Y		Y	Y		
North Yamhill River	Y	X	X	X	X	X	X	X	X	Y	X	X	X	X		X
Upper North Yamhill	Y	Y	X	X	X	Y	Y	Y	X	Y	X		X	X		
Panther Creek	X	Y	X	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	X	
Molalla-Pudding																
Molalla River	X	X	X	Y	X	X	Y	Y	X	X	X	X	X	Y		
Molalla Frontal	X	X	X	Y	X	X	Y	Y	X	X	X	X	X	Y		
North Fork Molalla		X				X	Y	Y	X	X	X		X	X		
Table Rock Fork						X	X	X	X	X	X		X	X		
Upper Molalla River						X	X	X	X	X	X		X	X		
Milk Creek	X	X	X	X	X	X	Y	Y	X	X	X		X	X	X	
Abiqua Creek	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Abiqua Creek	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Butte Creek	X	X		X	X	Y	Y	Y	X	X	X	X	X	X	X	
Rock Creek		X	X	X	X		Y	Y								
Rock Creek (Pudding)		X	X	X	X	X	Y	Y	X	X	X		X	X		
Tualatin																
Tualatin River	Y	Y	Y	Y	Y	Y	Y	Y	Y	X	Y	Y	Y	Y	X	
Scoggins Creek	Y	X	Y	X	X	Y	X	X	X	X	X	X	X	X		
Lee Creek						X	Y	Y	X	X	X		X	X		
Tualatin Frontal	Y	Y	Y	Y	X	X	X	X	X	X	Y	Y	Y	Y	X	
Dairy Creek	X	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	X	
East Fork Dairy Ck		X	X	X	X	X	X	X	X	X	X		X	X	X	
McKay Creek	X	Y	X	Y	Y	Y	Y	Y	Y	Y	X	X	X	X	X	
Upper McKay Creek	X	Y	X	Y	Y	Y	Y	Y	Y	Y	X		X	X	X	

Appendix 3-C Beneficial Uses Within the Planning Area by Basin and Analytical Watershed (cont.)

State Planning Basin / USGS Hydrologic Unit / Major Watershed / Subwatershed	Municipal Domestic Water	Private Domestic Water	Industrial Water Supply	Irrigation	Livestock Watering	Anadromous Fish Passage	Salmonid Fish Rearing	Salmonid Fish Spawning	Resident Fish and Aquatic Life	Wildlife and Hunting	Fishing	Boating	Water Contact Recreation	Aesthetic Quality	Hydro Power	Commercial Navigation and Transportation
Clackamas																
Hot Springs Fork Collawash							Y	Y	Y	X	X	X	X	Y		
Hot Springs Fork							X	Y	Y	X	X		X	Y		
Clackamas River	X	X	X	X	X	Y	Y	Y	Y	X	X	Y	Y	Y	X	X
Clackamas Frontal	X	X	X	X	X	X	Y	Y	X	X	X	X	X	X	X	
North Fork Clackamas		X	X			Y	X	X	X	X	X	X	X	X		
South Fork Clackamas	X					Y	Y	Y	Y	X	X		X	Y		
Fish Creek						Y	Y	Y	Y	X	Y	Y	Y	Y		
Eagle Creek		X	X	X	X	Y	Y	Y	Y		Y	Y	Y	Y	X	
Clear Creek (Clack)		X	X	X	X		X	Y	X	X	X	X	X	X		
Deep Creek		X	X	X	X	Y	X	X	X	X	X		X	X	X	
Deep Creek		X	X	X	X	Y	X	X	X	X	X		X	X	X	
L Willamette Frontal		X	X	X	X	X	X	Y	Y	Y	X	X	X	X	Y	
Scappoose River		X	Y	X	Y	Y	Y	Y	Y	Y	Y	X	X	X	Y	
Milton Creek	X	X		Y	Y	Y	Y	Y	Y	Y	X		X	Y		
Mult Channel Frontal		X		Y	Y	X	Y	Y	Y	Y	X	X	X	Y	X	
North Fork Scappoose		X	X	X	X	X	X	X	X	X	X		X	X		
South Fork Scappoose	X	Y	X	Y	Y	Y	Y	Y	Y	Y	X		X	Y		
Sandy Basin																
Lower Columbia-Sandy																
Sandy Frontal	X	X	X	X	X	X	Y	X	Y	X	Y	Y	Y	Y	Y	X
Bull Run River	X	X	X	X	X	Y	Y	Y	Y	X	X		Y	Y		
Mid Coast Basin																
Siletz-Yaquina																
Salmon River	Y	Y	X	X	X	X	Y	Y	Y	Y	X	X	X	X		
Drift Creek (Siletz)	X	X		X	X	X	Y	Y	Y	X	X		X	X		
Schooner Creek		X				Y	Y	Y	Y	Y	Y	Y	Y	Y		

Appendix 3-C Beneficial Uses Within the Planning Area by Basin and Analytical Watershed (cont.)

State Planning Basin / USGS Hydrologic Unit / Major Watershed / Subwatershed	Municipal Domestic Water	Private Domestic Water	Industrial Water Supply	Irrigation	Livestock Watering	Anadromous Fish Passage	Salmonid Fish Rearing	Salmonid Fish Spawning	Resident Fish and Aquatic Life	Wildlife and Hunting	Fishing	Boating	Water Contact Recreation	Aesthetic Quality	Hydro Power	Commercial Navigation and Transportation
Siletz River	X	X	X	X	X	Y	Y	Y	Y	X	Y	Y	Y	X		X
North Fork Siletz	X	X	X	X	X	Y	Y	Y	X	X	X		X	X		
South Fork Siletz		X	X	X	X	X	Y	Y	X	X	X		X	X		
Rock Creek (Siletz)		X		X	X	X	Y	Y	Y	X	X		X	X		
Yaquina River	X	X	X	X	X	X	Y	Y	Y	X	X	X	X	X		X
Elk Ck (Yaquina)				X	X	X	Y	Y	Y	X	Y		Y	Y		X
Yaquina River	X	X	X	X	X	X	Y	Y	Y	X	Y	Y	Y	Y		X
Alsea																
Alsea River	X	X	X	X	X	Y	Y	Y	Y	X	X	X	X	Y	Y	X
Crooked Creek		X		X	X	X	Y	Y	Y	X	X		X	X		
North Fork Alsea	X	X		X	X	Y	X	X	X	X	X		X	X		
Fall Creek		X		X	X	Y	Y	Y	X	X	Y	Y	Y	X		
Upper So Fk Alsea		X		X	X	Y	X	X	X	X	X		X	X		
Lower So Fk Alsea		X		X	X	X	Y	Y	Y	X	Y		Y	X		
Alsea Frontal	X	X	X	X	X	X	Y	Y	Y	X	X	X	X	X		X
N Alsea Pacific	X	X	X	X	X	X	Y	Y	Y	X	X		X	Y		
Drift Creek (Alsea)	X	X		X	X	Y	Y	Y	Y	X	Y	Y	Y			
Alsea Bay	X	X	X	X	X	X	Y	Y	Y	X	X		X	Y	Y	X
Lobster Creek		X		X	X	X	Y	Y	Y	X	X	X	X	X		
Upper Lobster		X		X	X	X	Y	Y	Y	X	X		X	X		
Lower Lobster		X		X	X	X	Y	Y	Y	X	X	X	X	X		
Yachats Pacific	X	X		Y	Y	X	Y	Y	Y	X	Y	Y	Y	Y		
North Coast Basin																
Lower Columbia-Clatskanie																
Clatskanie	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Nehalem																
Nehalem River	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
East Fork Nehalem		Y	X	Y	Y	Y	Y	Y	Y	Y	X		X	Y		

Appendix 3-C Beneficial Uses Within the Planning Area by Basin and Analytical Watershed (cont.)

State Planning Basin / USGS Hydrologic Unit / Major Watershed / Subwatershed	Municipal Domestic Water	Private Domestic Water	Industrial Water Supply	Irrigation	Livestock Watering	Anadromous Fish Passage	Salmonid Fish Rearing	Salmonid Fish Spawning	Resident Fish and Aquatic Life	Wildlife and Hunting	Fishing	Boating	Water Contact Recreation	Aesthetic Quality	Hydro Power	Commercial Navigation and Transportation
Wilson-Trask-Nestucca																
Kilchis River	X	X	X	X	X	X	Y	Y	Y	X	Y	Y	Y	Y		
Little So Fk Kilchis						X	X	X	X	X	X		X	X		
Clear Ck (Kilchis)						X	X	X	X	X	X		X	X		
Kilchis Frontal		X		X	X	X	Y	Y	Y	X	Y	Y	Y	Y		
Wilson River	X	X	X	X	X	X	Y	Y	Y	X	Y	Y	Y	Y		
Little N Fk Wilson		X				X	X	X	X	X	Y	Y	Y	Y		
Wilson Frontal	X	X	X	X	X	X	Y	Y	Y	Y	Y	Y	Y	Y		
Trask River		X	Y		X	X	X	Y	Y	Y	Y	Y	Y	Y	Y	
Trask Frontal		Y		X	X	X	Y	Y	Y	Y	Y	Y	Y	Y		
North Fork Trask	X	Y		X	X	X	Y	Y	Y	Y	Y	Y	Y	Y		
South Fork Trask		Y		X	X	X	Y	Y	Y	Y	Y	Y	Y	Y		
Tillamook River	X	X	X	X	X	X	Y	Y	Y	Y	Y	Y	Y	Y		X
Munson Creek		X		X	X	Y	X	X	X	X	X		X	X		
Nestucca River		Y	Y	X	X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Upper Nestucca	X					Y	Y	Y	Y	X	Y	Y	Y	Y		
Elk Creek (Nestucca)						Y	X	X	X	X	X		X	X		
Bear Creek	X		X	X	Y	Y	Y	X	X	X	X		X	X		
Testament Creek			X	X	X	Y	Y	Y	X	X	X		X	X		
Bible Creek						Y	X	X	X	X	X		X	X		
Moon Creek		X		X	X	X	Y	Y	X	X	X		X	X	X	
Beaver Creek	X	X	X	X	X	X	Y	Y	Y	Y	Y	Y	Y	Y		
Nestucca Frontal	X	Y	X	X	X	X	Y	Y	Y	Y	Y	Y	Y	X		
Little Nestucca		X	X	X	X	X	Y	Y	Y	Y	Y	Y	Y	Y		

1/ The Nehalem River watershed is mapped for this RMP as a large grouping of various watersheds in the northwestern portion of the district. This largegrouping was necessary due to the lack of BLM controlled land in this portion of the district.
X = Beneficial Use Within Basin Y = Beneficial Uses Exist And May Be Adversely Impacted By Water Quality.
Source: WODDB, OWRD (WRIS — Water Resource Information System), ODEQ (319 Report)

Appendix 3-D
Lakes and Water Impoundments*

Lakes and Water Impoundments*

Watershed Name 1	Name 2	Location	Size(Ac) 3	Use 4
	Jewit L.	T01N,R02E Sec 13	93	
	Fairview L.	T01N,R03E Sec 21	56	
	Blue L.	T01N,R03E Sec 21	58	
	Cape Meares L.	T01S,R10W Sec 07	98	
	Bybee L.	T02N,R01E Sec 30	275	PA
	Smith L.	T02N,R01E Sec 31	643	PA
	Ramsey L.	T02N,R01W Sec 26	90	
	Oswego L.	T02S,R01E Sec 10	405	DO IR
	Sturgeon L.	T03N,R01W Sec 10	3175	WI
	Aarons L.	T03N,R01W Sec 10	70	
	Steelman L.	T03N,R01W Sec 17	88	
	Crane L.	T03N,R01W Sec 04	120	
	River Mill Res.	T03S,R04E Sec 19	100	IR FP
	Estacada L.	T03S,R04E Sec 29	58	
	Henpici L.	T04N,R01W Sec 21	62	
	Cunningham L.	T04N,R01W Sec 21	155	
	McNary L.	T04N,R01W Sec 34	208	
	Deer Island Slough	T05N,R01W Sec 16	147	
	Cheadle L.	T12S,R02W Sec 23	84	
		T02N,R02W Sec 27	10	RC FP
Alsea Frontal		T13S,R07W Sec 32	5	IR
Alsea Frontal		T14S,R07W Sec 06	5	MU IR
Alsea Frontal		T14S,R08W Sec 01	5	IR
Alsea Frontal		T14S,R08W Sec 02	6	IR DO
Alsea Frontal		T14S,R08W Sec 02 03	11	IR DO
Alsea Frontal		T14S,R08W Sec 06	10	IR
Alsea Frontal		T14S,R08W Sec 07	7	
Alsea Frontal		T14S,R08W Sec 09 16 08	9	IR
Alsea Frontal		T14S,R08W Sec 10	15	IR
Alsea Frontal		T14S,R08W Sec 17 20	12	IR
Alsea Frontal		T14S,R08W Sec 18	6	
Alsea Frontal		T14S,R08W Sec 19	7	
Alsea Frontal		T14S,R08W Sec 20	6	IR
Bull Run River	Bull Run Res. No. 2	T01S,R05E Sec 25 26	411	MU
Bull Run River	Bull Run Res. No. 1	T01S,R06E Sec 16	450	MU

Lakes and Water Impoundments* (cont.)

Watershed Name 1	Name 2	Location	Size(Ac) 3	Use 4
Butte Creek		T06S,R02E Sec 22	19	FI IR
Butte Creek		T07S,R02E Sec 16	9	
Clackamas Frontal	NORTH FORK RES.	T04S,R04E Sec 02 11 12 13	346	
Clackamas Frontal		T04S,R05E Sec 03 11	75	
Clatskanie		T05N,R02W Sec 31	15	RC
Clatskanie		T05N,R03W Sec 36	22	RC
Clear Creek (Clack)	Horseshoe L.	T04S,R03W Sec 23	7	IR
Crabtree Creek		T11S,R01E Sec 07 18	13	IR
Crabtree Creek		T11S,R01E Sec 17 18 20 21	20	LV IR
Crabtree Creek		T11S,R01E Sec 22	7	IM
Crabtree Creek		T11S,R01E Sec 23	10	
Crabtree Creek		T11S,R01E Sec 25	10	IR PW
Crabtree Creek		T11S,R02E Sec 12	6	
Crabtree Creek		T11S,R02E Sec 30	7	
Crabtree Creek	Crabtree L.	T11S,R03E Sec 16	6	
Crooked Creek		T13S,R07W Sec 21 28	7	IR
Dairy Creek		T02N,R03W Sec 26	6	IR
Dairy Creek		T02N,R03W Sec 36	9	IR
Dairy Creek	Hartwick Res.	T02N,R04W Sec 36	10	IR
Drift Creek (Alsea)	Eckman L.(Res.)	T13S,R11W Sec 28	61	ID DS
Eagle Creek		T03S,R04E Sec 10	11	FI
Eagle Creek		T03S,R04E Sec 11	9	
Eagle Creek		T03S,R04E Sec 14	8	
Eagle Creek		T03S,R04E Sec 24	7	FI
Eagle Creek		T03S,R05E Sec 26	7	
Eagle Creek		T03S,R05E Sec 27	9	
Eagle Creek		T03S,R05E Sec 28	7	PW DO FI
Eagle Creek		T03S,R05E Sec 30	7	
East Fork Dairy Ck		T02N,R03W Sec 04	8	IR
East Fork Dairy Ck		T02N,R03W Sec 09	6	IR
East Fork Dairy Ck		T03N,R03W Sec 29	5	
East Fork Dairy Ck	Walker Res.	T03S,R03W Sec 02	7	IR
East Fork Nehalem	Gunner L.	T04N,R03W Sec 20	10	
Hamilton Mcdowell		T12S,R01E Sec 17 21	8	IR
Kichis Frontal		T01N,R09W Sec 32	9	MU
Kichis Frontal		T01N,R09W Sec 33	6	MU
Kichis Frontal		T01N,R09W Sec 33	5	
Kilchis River		T01N,R09W Sec 31	6	MU

Lakes and Water Impoundments* (cont.)

Watershed Name 1	Name 2	Location	Size(Ac) 3	Use 4
L Willamette Frontal		T02N,R02W Sec 01	38	
L Willamette Frontal		T02N,R02W Sec 01	6	
L Willamette Frontal		T02N,R02W Sec 12	19	
L Willamette Frontal		T03N,R02W Sec 25	78	DO IR
L Willamette Frontal	Joy Ck. Wetland	T03N,R02W Sec 25	11	
Little Luckiamute R		T08S,R08W Sec 14	8	
Little N Fk Santaim		T08S,R04E Sec 31	8	DI DO
Little N Fk Santaim		T08S,R04E Sec 32	6	DI DO
Little N Fk Santaim		T09S,R02E Sec 09	9	IR LV
Little N Fk Santaim		T09S,R02E Sec 12	5	
Little N Fk Santaim		T09S,R03E Sec 02	12	IR DO
Little N Fk Santaim		T09S,R03E Sec 09	5	
Little N Fk Santaim		T09S,R03E Sec 10	8	RC
Little N Fk Santaim		T09S,R03E Sec 18	12	DN
Little N Fk Santaim	Meridian L.	T09S,R03W Sec 34	6	
Little N Fk Santaim	Opal L.	T09S,R05E Sec 17	13	
Little So Fk Kilchis	Spring L.	T01N,R08W Sec 30	12	
Lower Middle Santiam	Green Peter Res.	T12S,R02E Sec 25 36	399	
Lower Middle Santiam	Green Peter Res.	T12S,R03E	2152	
Lower Rickreall Ck	Dallas Res.	T08S,R06W Sec 06	30	MU
Lower Rickreall Ck	Dallas Res.	T08S,R07W Sec 01	22	MU
Marys River	Thompson Res.	T12S,R07W Sec 06	32	RC
Milk Creek	Conner L.	T04S,R03W Sec 24	5	IM IR
Molalla Frontal	Goose Lake	T06S,R03W Sec 10	11	IR
Molalla Frontal		T07S,R03E Sec 06	8	
Molalla Frontal		T07S,R03E Sec 07	8	
Molalla Frontal		T07S,R03E Sec 08	12	
Molalla Frontal		T07S,R03E Sec 16	8	
Muddy Creek		T13S,R06W Sec 13	7	
N Alsea Pacific	Hidden L.	T13S,R11W Sec 07	6	
N. Santiam Frontal		T09S,R02E Sec 18	12	IR
N. Santiam Frontal		T09S,R02E Sec 18	12	IR
N. Santiam Frontal		T09S,R02E Sec 18	9	IR
N. Santiam Frontal		T09S,R02E Sec 19	10	
N. Santiam Frontal		T09S,R02E Sec 20	13	
N. Santiam Frontal		T09S,R02E Sec 20	26	IM IR WI FI LV
N. Santiam Frontal		T09S,R02E Sec 21	23	IR
N. Santiam Frontal		T09S,R02E Sec 23	27	

Lakes and Water Impoundments* (cont.)

Watershed Name 1	Name 2	Location	Size(Ac) 3	Use 4
N. Santiam Frontal		T09S,R02E Sec 25	21	IM
N. Santiam Frontal		T09S,R02E Sec 28	28	
N. Santiam Frontal		T09S,R03E Sec 25	18	IR
N. Santiam Frontal		T09S,R03E Sec 26	23	MU
N. Santiam Frontal		T09S,R03E Sec 27 28	24	DO
N. Santiam Frontal		T09S,R03E Sec 29	19	PW IM IR
N. Santiam Frontal		T09S,R03E Sec 30	31	IR I* LV DO DI FP
N. Santiam Frontal		T09S,R03E Sec 32	15	
N. Santiam Frontal		T09S,R04E Sec 28	10	
N. Santiam Frontal		T09S,R04E Sec 29	10	
N. Santiam Frontal		T09S,R04E Sec 29	7	
N. Santiam Frontal		T09S,R04E Sec 30	9	FI
N. Santiam Frontal	Big Cliff Res.	T09S,R04E Sec 35	100	
Nehalem River	Lytle L.	T02N,R10W Sec 29	57	
Nehalem River	Fishhawk L.	T06N,R06W Sec 01	67	RC
Nehalem River	Sunset L.	T07N,R10W Sec 21	99	IR
Nehalem River	Coffenbury L.	T08N,R10W Sec 07	52	
Nestucca Frontal		T03S,R07W Sec 31	7	
Nestucca Frontal		T03S,R07W Sec 32	6	
Nestucca Frontal		T04S,R07W Sec 06	10	
North Fork Alsea		T12S,R08W Sec 33	9	
North Fork Molalla	Hubbard L.	T05S,R03W Sec 15	23	
North Fork Molalla	Curry L.	T05S,R03W Sec 21	7	IR
North Fork Molalla	Cougar L.	T06S,R04E Sec 24	7	
North Fork Molalla	Emerald L.	T06S,R04E Sec 29	7	
North Fork Siletz		T07S,R08W Sec 16	9	
North Fork Siletz		T08S,R08W Sec 06	6	
North Fork Trask	Barney Res.	T01S,R06W Sec 36	47	MU PA
North Fork Trask		T01S,R07W Sec 24	7	
North Fork Trask		T01S,R07W Sec 25 26	9	
North Fork Trask		T01S,R07W Sec 26 27	9	
North Fork Trask		T01S,R07W Sec 27	6	
North Fork Trask		T01S,R07W Sec 28	7	
North Fork Trask		T01S,R07W Sec 28 33	9	
North Fork Trask		T01S,R07W Sec 29	12	
North Fork Trask		T01S,R07W Sec 30	5	
North Fork Trask	Barney Res.	T02S,R06W Sec 01	9	MU PA
Quartzville Creek	Timber Linn L.	T11S,R03W Sec 04	5	

Lakes and Water Impoundments* (cont.)

Watershed Name 1	Name 2	Location	Size(Ac) 3	Use 4
Quartzville Creek	Waverly L.	T11S,R03W Sec 05	9	
Quartzville Creek		T11S,R04E Sec 19 30 29	9	MI
Quartzville Creek		T11S,R04E Sec 20 21	6	
Quartzville Creek		T11S,R04E Sec 28	8	
Quartzville Creek		T11S,R04E Sec 29	8	
Quartzville Creek		T12S,R03E Sec 03	5	
Quartzville Creek		T12S,R03E Sec 10	6	
Salmon River	Ltl. Salmon Ck. Wetland	T07S,R09W Sec 02	28	
Salmon River	Deer Creek Wetland	T07S,R09W Sec 03	7	
Sandy Frontal		T01S,R05E Sec 13	13	
Sandy Frontal		T01S,R05E Sec 30	27	
Sandy Frontal	Roslyn L.	T02S,R05E Sec 06	139	
Sandy Frontal		T02S,R06E Sec 19	20	
Sandy Frontal		T02S,R06E Sec 20	17	
Sandy Frontal		T02S,R06E Sec 20	12	
Sandy Frontal		T02S,R06E Sec 21	10	
Sandy Frontal		T02S,R06E Sec 21	20	
Sandy Frontal		T02S,R06E Sec 22	8	
Sandy Frontal		T02S,R06E Sec 23	13	DO
Sandy Frontal		T02S,R06E Sec 24	29	DO
Sandy Frontal		T02S,R06E Sec 25	9	DO
Sandy Frontal		T02S,R06E Sec 25	7	DO
Sandy Frontal		T03S,R05E Sec 02	12	
Scoggins Creek	Henry Haag L. (Res.)	T01S,R04W Sec 20	1113	NU IM MU
Scoggins Creek	Henry Haag L. (Res.)	T01S,R05W Sec 12	11	NU IM MU
Siletz River		T08S,R08W Sec 07	6	
Siletz River		T08S,R08W Sec 07	14	
Siletz River		T08S,R08W Sec 18	10	
Siletz River		T08S,R08W Sec 18	7	
Siletz River		T08S,R08W Sec 18	6	
South Fork Clackamas	Memaloose L.	T05S,R04E Sec 26	5	
South Fork Siletz		T08S,R08W Sec 33	8	
Table Rock Fork		T07S,R03E Sec 12	5	
Table Rock Fork		T07S,R03E Sec 14	10	
Table Rock Fork		T07S,R04E Sec 07	6	
Thomas Creek		T10S,R02E Sec 07 08	11	
Thomas Creek		T10S,R02E Sec 15	7	
Thomas Creek	Indian Prairie L.	T10S,R02E Sec 33	17	

Lakes and Water Impoundments* (cont.)

Watershed Name 1	Name 2	Location	Size(Ac) 3	Use 4
Thomas Creek	Fourth L.	T10S,R03W Sec 29	8	IR
Thomas Creek		T11S,R02E Sec 04	12	
Tualatin Frontal	Colorado L.	T01S,R04W Sec 30	26	
Upper Luckiamute R		T09S,R07W Sec 28 33	7	
Upper Luckiamute R		T09S,R07W Sec 34	6	
Upper Nestucca	Meadow L. (Res)	T03S,R06W Sec 08	93	
Upper Nestucca	Walker Creek Res.	T03S,R06W Sec 15	175	MU
Upper Nestucca	McMinnville Res.	T03S,R06W Sec 15	140	MU
Upper Nestucca		T03S,R07W Sec 26	5	
Upper North Yamhill	Haskins Creek Res.	T03S,R05W Sec 18	23	MU
Upper North Yamhill	Haskins Creek Res.	T03S,R06W Sec 13	11	MU
Willamina Frontal		T05S,R07W Sec 12	6	IR
Willamina Frontal		T05S,R07W Sec 13	7	IR
Willamina Frontal		T05S,R07W Sec 36	7	IR
Yaquina River	Olalla Res.	T10S,R10W Sec 20	117	IM
Yaquina River	Big Creek Res.	T10S,R11W Sec 33	25	MU
Yaquina River	Big Creek Res. No. 2	T10S,R11W Sec 33	30	MU
Yaquina River	Bradish L.	T11S,R08W Sec 19	10	
Yaquina River	W.O.W. Lof Pond (Res)	T11S,R09W Sec 04	16	
Yaquina River	Olalla Barrier Res.	T11S,R10W Sec 17	96	IM
Yaquina River	Mill Creek Res.	T11S,R10W Sec 33	15	MU

* Water Impoundments on BLM Lands and All Lakes & Reservoirs

1 Watershed Names are Listed Where the Water Body is in an Analytical Watershed

2 Lake Names are Listed Where Available

3 Only Those 5 Acres and Larger are Shown

4 Use Key: DO = Domestic DI = /Inc Lawn & Garden DN = /Inc Non-Commercial DS = /Stock;
FI = Fish; FP = Fire Protection; IM = Industrial/Manufacturing;
IR = Irrigation I* = /Domestic/Stock ID = /Domestic;
LV = Livestock; MU = Municipal; NU = Nursery Use;
PA = Pollution Abatement; PW = Power; RC = Recreation WI = wildlife

Source: WODDB, OWRD (WRIS — Water Resources Information System)

Appendix 3-E
Pollution Type, Severity

Appendix 3-E Pollution Type, Severity

State Planning Basin USGS Hydrologic Unit Major Watershed Subwatershed	Turb	Low Do	Temp	Nutr	Pest	Toxic	B/V	Gases	Solids	Sed	Erosion	Low Flow	Debris	Struct	Plants	Other
Willamette Basin																
Upper Willamette																
*Muddy Creek																
*Marys River	M2						S1			M2	M2					
Luckiamute R	S2/M2	S1/S2/M2	S2							M2	S2/M2	S1/S2/M2	S2			
*Pedee Creek	M2	S1								M2	M2	S1				
*Upper Luckiamute R	M2									M2	M2					
*Little Luckiamute R	S2/M2	S2/M2	S2							M2	S2/M2	S2/M2	S2			
North Santiam	M2	M1					M1			M1	M2	M1				
*Little N Fk Santiam		M1					M1			M1		M1				
*North Santiam River																
*N Santiam Frontal	M2										M2					
South Santiam																
*Upper South Santiam	M1			M1/M2	M2		M1			M1	M1			M1/M2	M2	
Middle Santiam River																
*Quartzville Creek				M2						M1				M2		
*Lower Middle Santiam				M2						M1/M2				M2		
*Hamilton McDowell	M1	M1								M1	M1	M1				
*Crabtree Creek	S2/M1/M2	M2								S2/M2/M1	S2/M1/M2	M2				
*Thomas Creek	M1	M1								M1	M1	M1				
Middle Willamette																
Rickreall Creek																
*Upper Rickreall Ck	M2	M2								M2	M2	M2				
*Lower Rickreall Ck	M2	M2								M2	M2	M2				
Abernathy Creek																
*Abernathy Creek																

Appendix 3-E Pollution Type, Severity (cont.)

State Planning Basin USGS Hydrologic Unit Major Watershed Subwatershed	Turb	Low Do	Temp	Nutr	Pest	Toxic	B/V	Gases	Solids	Sed	Erosion	Low Flow	Debris	Struct	Plants	Other
Yamhill																
*Upper South Yamhill	M2	M2								M2	M2	M2				
*Rock Creek (Yamhill)																
*Rowell-Gold Creek																
Willamina Creek																
*Upper Willamina	M2						S2				M2					
*Coast Creek	M2										M2					
*Willamina Frontal	M2						S2				M2					
South Yamhill River																
*Deer Creek	M2	M2					S2			M2	M2	M2				
*Mill Creek	M2	M2								M2	M2	M2				
*Gooseneck Creek	S2	M2								M2	S2	M2				
*North Yamhill River								S1			M2					
*Upper North Yamhill		M2					S1			M2		M2				
*Panther Creek										S2						
Molalla-Pudding																
Molalla River																
*Molalla Frontal	S2	M1								M2	S2	M1				
*North Fork Molalla										M2						
*Table Rock Fork																
*Upper Molalla River																
*Milk Creek																
Abiqua Creek																
*Abiqua Creek																
*Butte Creek		M1										M1				
Rock Creek	S2	M2		M2						S2	S2	M2		M2		
*Rock Creek (Pudding)	S2	M2		M2						S2	S2	M2		M2		

Appendix 3-E Pollution Type, Severity (cont.)

State Planning Basin / USGS Hydrologic Unit / Major Watershed / Subwatershed	Turb	Low Do	Temp	Nutr	Pest	Toxic	B/V	Gases	Solids	Sed	Erosion	Low Flow	Debris	Struct	Plants	Other
Tualatin																
Tualatin River	S2	S2	S2		S1		M1		S2	S2	S2	S2	S2		S1	
*Scoggins Creek							M1		M1							
*Lee Creek				M2										M2		
*Tualatin Frontal	S2		S2				S1			S2	S2		S2			
*Dairy Creek	M2	S2	S2				S1			M2	M2	S2	S2			
*East Fork Dairy Ck																
*McKay Creek	M2		M2		M1		S1			M2	M2		M2		M1	
*Upper McKay Creek	M2		M2		M1		S1			M2	M2		M2		M1	
Nestucca River	M2	M2		M2			S1/M1			M2	M2	M2		M2		
*Upper Nestucca		M2		M2						M2		M2		M2		
*Elk Creek (Nestucca)																
*Bear Creek																
*Testament Creek																
*Bible Creek																
*Moon Creek																
*Beaver Creek		M2										M2				
*Nestucca Frontal	M2	M2		M2			M2			M2	M2	M2		M2		
*Little Nestucca	M2			S2						M2	M2			S2		
Sandy Basin																
Lower Columbia-Sandy																
*Sandy Frontal	S2	M2		S2						M2	S2	M2		S2		
*Bull Run River		M1/M2										M1/M2				
Mid Coast Basin																
Siletz-Yaquina																
*Salmon River	M2			M2						M2	M2			M2		
*Drift Creek (Siletz)	M2									M2	M2					
*Schooner Creek					M1	S1									M1	S1

Appendix 3-E Pollution Type, Severity (cont.)

State Planning Basin / USGS Hydrologic Unit / Major Watershed / Subwatershed	Turb	Low Do	Temp	Nutr	Pest	Toxic	B/V	Gases	Solids	Sed	Erosion	Low Flow	Debris	Struct	Plants	Other
*Siletz River	M2	M2		M2						M2	M2	M2		M2		
*North Fork Siletz	M2										M2					
*South Fork Siletz																
*Rock Creek (Siletz)	M2									M2	M2					
Yaquina River																
*Elk Ck (Yaquina)	M2			M2						M2	M2			M2		
*Yaquina River	M2			M2						M2	M2			M2		
Alsea																
Alsea River	M2	M2								M2	M2	M2				
*Crooked Creek																
*North Fork Alsea																
*Fall Creek																
*Upper So Fk Alsea	M2									M2	M2					
*Lower So Fk Alsea	M2									M2	M2					
*Alsea Frontal	M2									M2	M2					
*N Alsea Pacific	M2									M2	M2			M2		
*Drift Creek (Alsea)	M2									M2	M2					
*Alsea Bay	M2	M2								M2	M2	M2				
Lobster Creek	M2									M2	M2			M2		
*Upper Lobster																
*Lower Lobster	M2									M2	M2					
*Yachats Pacific	M1/M2			S1/M2						M1/M2	M1/M2			S1/M2		
Clackamas																
Hot Springs Fork Collawash	S1/M1			S1/M1						M2	S1			S1/M1/M2		
*Hot Springs Fork	S1/M1/M2			S1/M1							S1			S1/M1		
Clackamas River																
*Clackamas Frontal	M2									M2	M2					
*North Fork Clackamas																
*South Fork Clackamas				M1										M1		
*Fish Creek	S1			S1/M2							S1			S1/M2		

Appendix 3-E Pollution Type, Severity (cont.)

State Planning Basin / USGS Hydrologic Unit / Major Watershed / Subwatershed	Turb	Low Do	Temp	Nutr	Pest	Toxic	B/V	Gases	Solids	Sed	Erosion	Low Flow	Debris	Struct	Plants	Other
*Eagle Creek	M1			M1							M1			M1		
*Clear Creek (Clack)																
Deep Creek																
*Deep Creek																
*L Willamette Frontal											M2					
Scappoose River	S2/M2		S2/M2							M2	S2/M2		S2/M2			
*Milton Creek	M2		M2							M2	S2/M2		M2			
*Mult Channel Frontal	M2		M2							M2	M2		M2			
*North Fork Scappoose																
*South Fork Scappoose	S2/M2		S2/M2							M2	M2		M2			
North Coast Basin																
Lower Columbia-Clatskanie																
Clatskanie	M2		M2							M2	M2		M2			
Nehalem																
*Nehalem River	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
*East Fork Nehalem	M2		M2							M2	M2		M2			
Wilson-Trask-Nestucca																
*Kilchis River	S2/M2	M2		S2/M2			S1			M2	S2/M2	M2		S2		
*Little So Fk Kilchis																
*Clear Ck (Kilchis)																
*Kilchis Frontal	S2	M2		S2			S1			M2	S2	M2		S2		
*Wilson River	M2			S2			M2			M2	M2			S2		
*Little N Fk Wilson	M2		S2	S2						M2	M2			S2		
*Wilson Frontal	M2	M2		S2/M2			S1/M2			M2	M2	M2		S2/M2		
Trask River																
*Trask Frontal	M2	M2	S2				S1/M1			M2	M2	M2		S2		
*North Fork Trask	M2	M2					M1			M2	M2	M2				
*South Fork Trask	M2	M2	S2				M1			M2	M2	M2		S2		

Appendix 3-E Pollution Type, Severity (cont.)

State Planning Basin USGS Hydrologic Unit Major Watershed Subwatershed	Turb	Low Do	Temp	Nutr	Pest	Toxic	B/V	Gases	Solids	Sed	Erosion	Low Flow	Debris	Struct	Plants	Other
Tillamook River	S2		S2				S1			S2	S2			S2		
*Munson Creek																

[1]The Nehalem River watershed is mapped for this RMP as a large grouping of various watersheds in the northwestern portion of the district. This large grouping was necessary due to the lack of BLM controlled land in this portion of the district.

* Analytical Watersheds

Turb	Turbidity	B/V	Bacteria/Viruses	Erosion	Streambank Erosion
Low-Do	Low Dissolved Oxygen	Radio	Radioisotopes	Lowflow	Decreased Streamflow
Temp	Elevated or Depressed Water Temperature	Gases	Dissolved Gases	Debris	Excessive Debris Accumulation
Nutr	Nutrients	Solid	Objectionable Discoloration, Scum, Oily Slick or Film, Floating Solids	Struct	Insufficient Stream Structure
Pest	Pesticides			Plants	Excessive Plant Growths
Toxic	Toxics	Sed	Sedimentation	Other	Other
Salt	Saline Water Intrusion				

S1 =	Data showing severe problem	M1 =	Data showing moderate problem
S2 =	Observation indicating severe problem	M2 =	Observation indicating moderate problem
S3 =	Perception indicating severe problem	M3 =	Perception indicating moderate problem

Source: WODDB, ODEQ (319 Report)

Appendix 3-F
Riparian Vegetation Classes in Selected Analytical Watersheds

Watershed Name	Stream Order	Stream Miles	Riparian Acres	Vegetation Classes (acres)[1] A	B	C	D	E
Alsea Frontal	1&2	217.1	1322.4	61	189	202	486	385
	3	40.5	765.0	0	0	239	478	48
	4	25.2	643.5	0	0	180	438	26
	5	7.1	258.8	0	0	72	176	10
	6&7	22.8	991.4	0	0	278	674	40
Bear Creek (Yamhill)	1&2	20.5	103.3	2	13	15	42	31
	3	3.4	63.3	0	0	0	63	0
	4	4.2	106.7	0	0	0	36	71
	5	0.0	0.0	0	0	0	0	0
	6	0.0	0.0	0	0	0	0	0
Bible Creek	1&2	18.4	113.9	5	10	22	37	40
	3	5.5	103.3	0	0	0	52	52
	4	3.9	100.3	0	0	0	0	100
	5	0.9	31.7	0	0	0	0	32
	6	0.0	0.0	0	0	0	0	0
Clear Ck (Kilchis)	1&2	22.9	97.0	0	10	6	55	26
	3	4.4	82.3	0	0	0	82	0
	4	1.3	32.7	0	0	0	33	0
	5	2.0	71.5	0	0	0	72	0
	6	0.0	1.7	0	0	0	2	0
Crooked Creek	1&2	41.1	351.3	14	7	68	223	41
	3	16.0	301.6	0	0	86	172	43
	4	9.2	234.3	0	0	67	134	33
	5	4.0	145.6	0	0	42	83	21
	6	0.0	0.0	0	0	0	0	0
East Fork Nehalem	1&2	53.9	282.8	27	57	42	88	69
	3	17.1	322.6	0	0	54	215	54
	4	7.0	180.1	0	0	30	60	90
	5	5.8	213.2	0	0	36	71	107
	6	0.0	0.0	0	0	0	0	0

Appendix 3-F (cont.)

Watershed Name	Stream Order	Stream Miles	Riparian Acres	Vegetation Classes (acres)[1] A	B	C	D	E
Elk Creek (Nestucca)	1&2	26.7	124.2	9	9	12	55	40
	3	7.6	144.3	0	0	0	96	48
	4	5.0	128.2	0	0	48	48	32
	5	5.6	203.2	0	0	76	76	51
	6	0.0	0.0	0	0	0	0	0
Fall Creek	1&2	105.4	272.4	18	41	50	117	47
	3	23.6	445.6	0	0	0	396	50
	4	11.8	302.3	0	0	25	227	50
	5	5.4	197.0	0	0	16	148	33
	6	0.0	0.0	0	0	0	0	0
Gooseneck Creek	1&2	34.9	145.1	0	4	7	127	7
	3	9.9	187.0	0	0	31	140	16
	4	0.6	15.6	0	0	3	12	1
	5	0.0	0.0	0	0	0	0	0
	6	0.0	0.0	0	0	0	0	0
Kilchis Frontal	1&2	23.9	297.9	39	26	26	91	117
	3	3.6	67.5	68	0	0	0	0
	4	0.9	23.3	23	0	0	0	0
	5	0.0	0.0	0	0	0	0	0
	6	5.3	227.8	228	0	0	0	0
Lower Lobster	1&2	119.4	1490.3	80	176	224	577	433
	3	16.6	314.0	0	0	179	135	0
	4	7.1	182.5	0	0	91	68	23
	5	2.6	93.1	0	0	47	35	12
	6	8.2	354.5	0	0	177	133	44
Lower So Fk Alsea	1&2	47.1	446.7	23	61	53	182	129
	3	13.4	253.8	0	0	32	222	0
	4	8.4	215.9	0	0	54	135	27
	5	2.4	86.8	0	0	22	54	11
	6	7.3	317.6	0	0	79	199	40
Mill Creek	1&2	91.6	625.4	15	34	93	362	122
	3	23.6	446.0	0	0	28	334	84
	4	9.9	252.6	0	0	0	185	67
	5	3.2	118.1	0	0	0	87	31
	6	9.4	408.4	0	0	0	300	109

Appendix 3-F (cont.)

Watershed Name	Stream Order	Stream Miles	Riparian Acres	Vegetation Classes (acres)[1] A	B	C	D	E
Moon Creek	1&2	44.8	262.7	16	14	30	120	82
	3	9.3	175.9	0	0	0	0	176
	4	4.1	105.9	0	0	0	0	106
	5	4.8	175.1	0	0	0	0	175
	6	0.0	0.0	0	0	0	0	0
North Fork Alsea	1&2	94.2	763.5	63	131	97	199	274
	3	23.3	440.8	0	0	73	147	220
	4	13.7	351.2	0	0	29	146	176
	5	4.3	157.6	0	0	13	66	79
	6	9.8	423.5	0	0	35	176	212
North Fork Siletz	1&2	95.7	716.7	10	34	127	453	93
	3	28.0	529.3	0	0	79	318	132
	4	22.4	574.1	0	0	60	363	151
	5	7.7	279.5	0	0	29	177	74
	6	2.2	94.7	0	0	10	60	25
Pedee Creek	1&2	29.6	249.8	6	12	23	163	46
	3	10.0	188.5	0	0	24	141	24
	4	5.1	131.2	0	0	44	87	0
	5	3.1	113.1	0	0	38	75	0
	6	0.0	0.0	0	0	0	0	0
Quartzville Creek	1&2	187.6	594.2	48	89	114	155	188
	3	43.7	826.4	39	118	236	394	39
	4	11.7	299.6	0	15	135	150	0
	5	13.3	486.8	0	24	219	243	0
	6	28.4	1232.8	0	62	555	616	0
Rowell-Gold Creek	1&2	39.4	100.0	4	12	24	51	9
	3	19.0	359.2	0	0	0	332	28
	4	3.8	96.7	0	0	0	89	7
	5	0.0	0.0	0	0	0	0	0
	6	0.0	0.0	0	0	0	0	0
Table Rock Fork	1&2	157.9	607.9	63	85	143	227	90
	3	18.8	356.1	24	36	83	131	83
	4	8.1	207.7	0	9	76	113	9
	5	12.7	463.7	0	21	169	253	21
	6	0.0	0.0	0	0	0	0	0

Appendix 3-F (cont.)

Watershed Name	Stream Order	Stream Miles	Riparian Acres	Vegetation Classes (acres)[1] A	B	C	D	E
Testament Creek	1&2	33.2	110.2	13	13	31	31	23
	3	2.7	50.7	0	0	0	38	13
	4	5.9	149.9	0	0	0	150	0
	5	0.0	0.0	0	0	0	0	0
	6	0.0	0.0	0	0	0	0	0
Upper Lobster	1&2	42.4	175.6	10	27	47	64	27
	3	6.8	128.2	0	0	92	37	0
	4	5.0	127.6	0	0	43	85	0
	5	2.9	106.5	0	0	36	71	0
	6	2.5	110.2	0	0	37	73	0
Upper Molalla River	1&2	144.1	691.4	26	122	187	244	112
	3	25.3	478.9	0	64	223	160	32
	4	6.7	170.3	0	0	57	76	38
	5	4.3	158.1	0	0	53	70	35
	6	7.3	317.7	0	0	106	141	71
Upper Nestucca	1&2	205.8	608.0	27	64	113	191	213
	3	23.5	443.6	0	0	0	254	190
	4	11.3	288.8	0	0	0	135	154
	5	15.6	569.1	0	0	0	266	304
	6	0.3	13.9	0	0	0	6	7
Upper Rickreall Ck	1&2	29.0	257.1	5	5	20	188	40
	3	6.4	120.8	0	0	20	60	40
	4	6.8	174.2	0	0	29	87	58
	5	3.5	126.6	0	0	21	63	42
	6	0.3	13.5	0	0	2	7	4
Upper So Fk Alsea	1&2	77.2	705.2	6	51	122	353	173
	3	19.3	365.2	0	0	21	215	129
	4	15.2	388.0	0	0	0	291	97
	5	6.8	247.3	0	0	0	186	62
	6	3.6	157.5	0	0	0	118	39

Appendix 3-F (cont.)

Watershed Name	Stream Order	Stream Miles	Riparian Acres	Vegetation Classes (acres)[1] A	B	C	D	E
Upper Willamina	1&2	282.9	912.9	25	62	118	460	248
	3	37.8	714.4	0	0	42	336	336
	4	15.1	385.6	0	0	18	315	53
	5	7.0	257.1	0	0	12	210	35
	6	10.5	456.4	0	0	21	373	62

1/Key For Riparian Vegetation Classes:

- A Riparian Vegetation Recently Cut
- B Seedling & Sappling (Generally no crown closure)
- C Pole Timber (Crown Closure)
- D Small Sawtimber (Carpet of timber)
- E Large Saw Timber (Individual trees visiable)

Source: WODDB; Photo inventory of all lands within selected analytical watersheds.

Appendix 3-G
Physical Characteristics of Selected Analytical Watersheds

Watershed Name	Analytical Watershed	Uncut >20 Yrs.	Established Riparian	Tractor Salvaged >20 Yrs.	Meadow	Rock Outcrop	Active Slides (Exposed Soils)	Lakes Ponds Reservoirs
Alsea Frontal	41,300	25,969	1,490	768	135	181	15	15
Bear Creek (Yamhill)	3,900	2,736	85	0	28	28	0	14
Bible Creek	4,800	3,068	116	26	13	51	13	13
Clear Ck (Kilchis)	2,800	1,990	104	0	19	9	0	0
Crooked Creek	9,900	7,746	338	191	59	235	59	0
East Fork Nehalem	14,200	8,363	526	452	86	73	12	24
Elk Creek (Nestucca)	6,300	4,327	320	51	13	26	13	13
Fall Creek	19,200	14,175	652	93	133	80	0	0
Gooseneck Creek	6,200	3,414	232	398	44	44	0	0
Kilchis Frontal	2,800	2,065	127	14	0	0	0	0
Lower Lobster	18,500	12,764	428	400	0	14	14	0
Lower So Fk Alsea	11,900	8,097	622	296	104	59	30	0
Mill Creek	22,100	15,343	806	190	190	202	78	0
Moon Creek	12,600	8,096	416	172	57	72	14	0
North For Alsea	20,700	14,148	822	284	284	57	14	0
North Fork Siletz	25,300	16,045	1,020	1,298	93	482	111	19
Pedee Creek	7,700	3,834	463	1,055	0	0	13	0
Quartzville Creek	64,000	40,922	1,419	601	265	241	265	24
Rowell-Gold Creek	10,600	6,636	228	30	46	46	0	0
Table Rock Fork	22,600	15,749	715	436	157	291	0	0
Testament Creek	4,400	2,301	351	24	36	48	0	0
Upper Lobster	9,100	6,437	376	182	182	65	0	13
Upper Molalla River	22,500	12,217	634	836	139	228	76	0
Upper Nestucca	16,600	10,298	837	209	13	65	13	118
Upper Rickreall Ck	6,800	4,687	270	188	94	294	0	0
Upper So Fk Alsea	19,700	14,808	888	396	96	205	14	0
Upper Willamina	25,500	17,390	725	533	118	74	0	15

Appendix 3-G (cont.)

Watershed Name	Clear Cutting Full Suspension	(Cable Yarding) One-End Suspension	Ground Lead	(Tractor Yarding) Logger's Choice	Designated Skid Roads	Burned (Recent)	Site Preparation Scarification Piling	Scarification W/ Tractor Yarding
Alsea Frontal	843	2,333	90	3,658	301	0	15	196
Bear Creek (Yamhill)	71	411	14	241	14	0	0	0
Bible Creek	270	462	13	385	77	13	0	90
Clear Ck (Kilchis)	85	313	47	123	0	0	9	0
Crooked Creek	29	397	29	220	44	0	44	15
East Fork Nehalem	575	1,382	110	1,663	159	73	196	257
Elk Creek (Nestucca)	179	807	128	154	0	64	13	0
Fall Creek	639	1,517	213	639	80	27	67	160
Gooseneck Creek	33	199	11	232	0	0	33	44
Kilchis Frontal	85	212	0	99	0	0	0	0
Lower Lobster	343	1,542	171	1,057	214	43	0	86
Lower So Fk Alsea	163	622	59	370	133	30	44	89
Mill Creek	258	2,419	56	1,053	67	11	56	45
Moon Creek	702	1,519	57	774	57	0	43	0
North For Alsea	780	1,347	241	1,262	156	0	14	298
North Fork Siletz	742	2,764	37	1,280	37	0	0	352
Pedee Creek	78	360	154	695	103	129	26	373
Quartzville Creek	3,079	8,396	457	4,330	120	337	48	577
Rowell-Gold Creek	350	1,126	137	1,385	0	0	0	518
Table Rock Fork	0	61	31	533	7	145	145	254
Testament Creek	315	509	48	351	73	48	24	24
Upper Lobster	260	701	78	402	26	0	0	65
Upper Molalla River	963	2,725	190	3,092	228	165	127	317
Upper Nestucca	353	2,054	170	1,505	118	196	26	26
Upper Rickreall Ck	47	200	12	764	12	12	0	117
Upper So Fk Alsea	219	1,093	27	1,011	150	0	14	109
Upper Willamina	651	2,309	148	1,998	148	118	252	44

Appendix 3-G (cont.)

Watershed Name	Roads Landings Rock Pits	Pasture	Plowed Field (Annual)	Christmas Trees	Orchard	Buildings Paved/ Rocked	Other Misc.	Estimated Compaction
Alsea Frontal	1,656	1,445	1,852	135	0	422	0	3,605
Bear Creek (Yamhill)	255	0	0	0	0	0	0	360
Bible Creek	244	13	0	0	0	0	0	457
Clear Ck (Kilchis)	123	0	0	0	0	0	0	182
Crooked Creek	412	59	44	0	0	29	0	819
East Fork Nehalem	783	0	0	0	0	0	0	1,622
Elk Creek (Nestucca)	294	0	0	0	0	0	0	415
Fall Creek	785	106	53	0	0	27	0	1,238
Gooseneck Creek	320	442	729	33	0	88	0	658
Kilchis Frontal	71	85	28	0	0	28	0	134
Lower Lobster	828	528	171	29	0	43	0	1,379
Lower So Fk Alsea	740	148	311	59	0	74	0	1,147
Mill Creek	694	112	515	0	0	78	0	1,414
Moon Creek	502	129	29	0	0	0	0	885
North For Alsea	1,077	170	28	0	0	0	0	1,725
North Fork Siletz	1,410	0	0	0	0	0	0	2,778
Pedee Creek	386	129	64	270	51	13	13	1,118
Quartzville Creek	3,921	0	0	0	0	0	0	5,979
Rowell-Gold Creek	472	152	0	0	0	0	0	1,129
Table Rock Fork	848	0	0	0	0	0	0	2,029
Testament Creek	291	12	24	0	0	0	0	478
Upper Lobster	337	0	0	0	0	0	0	607
Upper Molalla River	1,141	0	0	0	0	0	0	2,648
Upper Nestucca	837	0	0	0	0	0	0	1,446
Upper Rickreall Ck	211	0	0	0	0	0	0	799
Upper So Fk Alsea	820	0	0	0	0	0	0	1,477
Upper Willamina	932	178	266	0	0	0	0	1,844

Source: Photo inventory of all lands within the selected analytical watersheds.

Appendix 3-H Watershed Condition Index Methodology

Introduction

The watershed condition index (WCI) is a method of rating the physiographic conditions (e.g., soil type) and land management activities (e.g., road building) which have some effect on the hydrological functions of watersheds. The index represents conditions on whole watersheds, including BLM, private and other agency lands. Therefore, the index is an indicator of the cumulative effects of all management activities, private and public.

The purpose of the WCI in this RMP is to compare the current condition (as of October 1, 1988) in a selected analytical watershed, with future conditions anticipated under each of the seven land management alternatives in the RMP. For purpose of analysis two assumptions are made:

- future BLM management activities described in the alternatives would occur during the last five years of the 10-year planning period once the RMP is implemented;
- 50 percent of all private harvestable timber, identified on BLM's Gross Vegetation GIS theme as Heavy Timber, would be cut during this planning decade.

Guidance for assessing conditions and calculating the individual indexes is summarized in the pages to follow.

The individual indexes are comprised of rating elements, which are mathematically combined in formulas and adjusted using a constant (X) to give a rating between 1 and 2. These constants are developed individually for each district. A rating of 1 implies watershed condition is minimally affected and 2 implies watershed condition is highly affected. Ratings in the mid-range are considered to have a moderate effect. The numeric value has no meaning by itself. Each rating element in a formula is assigned a multiplier which reflects the relative impact of each element on the watershed condition. For example, a paved road has less impact on watershed condition than a dirt road. The paved road is given a low weighting, and the dirt road is given a high weighting. These weightings are based on the professional knowledge and judgment of district soil scientists and hydrologists.

The WCIs are gross indicators of current and future watershed conditions. Differences in watershed condition due to individual activities will be analyzed during project planning in the respective environmental assessments.

The formula for calculating the watershed condition indexes is:

$$WCI=SDI*VI*SI*RI*MI*KI*AI*DI*PI*FI*LI$$

WCI = watershed condition index
SDI = soil disturbance index
VI = vegetation index
SI = silvicultural index
RI = riparian index
MI = mining index
KI = soils index
AI = slope/aspect index
DI = drainage density index
PI = precipitation index
FI = flow index
LI = landslide index

The product of all rating indexes is the watershed condition index.

Individual Index Calculations

Soil Disturbance Rating Method: Soil disturbance was rated by calculating the acres of roads (by surface type), skid trails, and other areas of soil disturbance. The data was collected through a photo inventory of the selected analytical watersheds and through WODDB (GIS) records. The formula for the soil disturbance index (SDI) is:

$$SDI=1+[(P+3R+6D+8S+3O)/W]$$

Where:

P=paved roads (acres)
R=rocked roads (acres)
D=dirt roads (acres)
S=skid trails (acres)
O=other disturbances, e.g., rock pits and large landings (acres
W=watershed size (acres)

Vegetation Type Rating Method: Each vegetation type was given a weighting based on its effect on watershed condition and water quality. The acreage of each current vegetation type was estimated through a photo inventory of the selected analytical watersheds. The acres assigned to the age class of partially cut lands were calculated as the area cut multiplied by the percent of volume cut. The formula used to calculate the vegetation index (VI) is:

$$VI=1+[(6M+3P+10D+4F0+7C)*X/W]$$

Where:

VI=vegetation index

M=meadow (grass) (acres)

P=pasture or permanent brush (acres)

D=disturbed (>20% bare soil) (acres)

F0=forest 0-20 years (acres

W=watershed size (acres)

C=area to be harvested in the 10-year period (acres) by alternative

X=constant (.42)

Silvicultural Practices Rating Method: Five silvicultural practices that can affect water quality and watershed condition have been identified through a photo inventory of the selected analytical watersheds and from resource area silviculturists' knowledge and records. The formula used to calculate the silvicultural index (SI) is:

$$SI=1+[(10T+5B+3H+2F+P)/W*X]$$

Where:

T=tractor piling (acres piled in the past 20 years)

B=burning (acres burned in the past 1-2 years)

H=herbicides (acres treated with herbicides in the past year)

P=PCT (acres thinned in the past 5 years)

W=watershed size (acres)

X=constant (.75)

Riparian Rating Method: Riparian conditions were classified through a photo inventory of the selected analytical watersheds. Total acres of each riparian type were projected from total riparian acres by stream order identified in WODDB. The formula used to calculate the riparian index (RI) is:

$$RI=1+[(8S+5P+3T+L)/R*X]$$

Where:

S=seedlings or saplings

P=pole timber

T=small saw timber

L=large saw timber

R=total acres of riparian zones

X=constant (.125)

Mining Rating Method: Mining was rated by the number of operation notices for placer and sand and gravel mining. Only existing notices were considered unless future plans were known. The formula used to calculate the mining index (MI) is:

$$MI=1+[(N/M)*X]$$

Where:

N=number of notices

M=miles of stream

X=constant (8)

Soils Rating Method: Soils were rated by using the K factor from the Universal Soil Loss Equation. The formula used to calculate the soils index (KI) is:

$$KI = 1+[(S1xK1+S2xK2...)/W*X]$$

Where:

S1, S2=acres of each soil series in the watershed

K1, K2=k numbers

W=watershed size (acres)

X=constant (3.5)

Slope-Aspect Rating Method: Slopes were calculated using GIS and the USGS digitized topography map at a scale of 1:250,000. Using the topography map at this scale those areas with long slopes and substantial changes in elevation were identified. Critical aspects were identified through the TPCC mapping of BLM-administered lands with excessively steep, nonsuitable woodlands. The TPCC categories included in the critical aspect factor are FGNW (slopes greater than 80 percent), stream adjacent slopes subject to mass failure, and FMNW (slopes prone to unacceptable surface erosion; greater than 90 percent). The formula used to calculate slope index (AI) is:

$$AI = 1+[((S/W)+(A/WB))*X]$$

Where:

S=area > 60 percent slope (acres)

A=area of critical slopes (FGNW & FMNW)

W=watershed size (acres)

WB=BLM ownership within watershed (acres)

X=constant (4.35)

Drainage Density Rating Method: Drainage density was calculated using the National Handbook of Recommended Methods for Water Data Acquisition. The formula used to calculate the drainage density index (DI) is:

$$DI = 1+(DD^*X)$$

DD=drainage density
X=constant (.08)

Precipitation Rating Method: Two-year, 24-hour precipitation amounts were used to calculate the precipitation index. The formula used to calculate the precipitation index (PI) is:

$$PI = 1+(P^*X)$$

Where:
P=precipitation from the average 2-year, 24-hour storm in the watershed.
X=constant (.125)

Flow Rating Method: Flow was obtained by using the USGS method of predicting a 2-year flood, measured in cubic feet per second per square mile (cfs/sq. mi.). The formula used to calculate the flow index (FI) is:

$$FI =1+(Q^*X)$$

Where:
Q=two-year flood (cfs/sq. mi.)
X=constant (.00525)

Landslide Rating Method: Slope stability was determined by rating each soil series as stable or unstable. The stability index is calculated from the percent of the basin that is unstable. The LI formula is:

$$LI=1+[((W-U)+(U^*9))/W^*X]$$

Where:
U=area of unstable soils (acres)
W=watershed size (acres)
X=constant (.1)

Current Watershed Condition

The current watershed conditions for the selected analytical watersheds, as determined through the use of the WCI (see table at the end of this appendix), are interpreted on the following pages. The WCI's individual indexes serve as indicators of potential management problems and opportunities within watersheds.

The selected analytical watersheds in Benton County are Alsea Frontal, Crooked Creek, Fall Creek, Lower Lobster, Lower South Fork Alsea, North Fork Alsea, Upper Lobster, and Upper South Fork Alsea. These watersheds are in the best overall condition of any group in the district. The WCIs vary from 26 (Upper South Fork Alsea) to 60 (Fall Creek).

The key concerns in this grouping of watersheds are:

- the high amount of Alsea Frontal watershed in areas of meadows, pastures, brush, young forests and areas with over 20 percent exposed soils. These conditions make the watershed highly susceptible to erosive forces such as rain, overland flow and landslides.
- the high amount of Upper Lobster watershed with riparian zones that are predominately young timber, brush or other openings. The lack of established riparian vegetation does not provide erosion protection, shading, streambank stability and structure for current and future aquatic needs.
- the very high drainage density in the Fall Creek watershed which indicates a high potential for erosion.
- the very high percentage of most of these watersheds with mapped unstable soils.

The selected analytical watersheds located in Polk and Lincoln counties consist of: Gooseneck Creek, Mill Creek, North Fork Siletz, Pedee Creek, Rowell-Gold Creek, Upper Rickreall Creek. These watersheds appear to be in worse overall condition than the other watershed groupings found in the Salem District's part of the Coast Range. The WCI ratings vary from 43 (Mill Creek) to 107 and 109 respectively for Pedee Creek and Rowell-Gold Creek.

The key concerns in this grouping of watersheds are:

- the high amount and very high amount of Rowell-Gold Creek and Pedee Creek watersheds respectively that are impacted by roads, skid trails and other disturbances which result in increased peak flows and erosion rates.
- the high amount of Gooseneck Creek, Pedee Creek, and Rowell-Gold Creek watersheds in areas of meadows, pastures, brush, young forests and areas with over 20 percent exposed soils. These conditions make the watershed highly susceptible to erosive forces such as rain, overland flow and landslides.

- the high amount of Pedee Creek, Rowell-Gold Creek, and Upper Rickreall Creek watersheds impacted by tractor piling operations which increase compaction, disturbance, peak flows and erosion rates.

- the very high amount of Pedee Creek watershed with riparian zones of predominately young timber, brush or other openings. The lack of established riparian vegetation does not provide erosion protection, shading, streambank stability and structure for current and future aquatic needs.

- the high erodibility of soils in the Gooseneck Creek watershed.

- the high amount of the North Fork Siletz and Upper Rickreall Creek watersheds with slopes greater than 60 percent and/or BLM-administered lands mapped as critical slopes.

- the high drainage density in the Gooseneck Creek and Rowell-Gold Creek watersheds which indicates high potentials for erosion.

- the high precipitation rating and flow rating for Upper Rickreall Creek and very high ratings for North Fork Siletz, indicating high erosion potential in these watersheds.

- the very high percentage of most of these watersheds with mapped unstable soils.

The selected analytical watersheds in Tillamook and Yamhill Counties are: Bear Creek, Bible Creek, Clear Creek (Kilchis), Elk Creek (Nestucca), Kilchis Frontal, Moon Creek, Testament Creek, Upper Nestucca, Upper Willamina. This grouping of watersheds has the second lowest set of WCI ratings in the district.

The key concerns in this grouping of watersheds are:

- the high amount of the Testament Creek watershed in areas of meadows, pastures, brush, young forests and areas with over 20 percent exposed soils. These conditions make the watershed highly susceptible to erosive forces such as rain, overland flow and landslides.

- the high erodibility of soils in the Bible Creek, Clear Creek, and Moon Creek watersheds and the very high erodibility of soils in the Kilchis Frontal watershed.

- the high and very high amount of the Clear Creek (Kilchis) and Moon Creek watersheds respectively with slopes greater than 60 percent and/or BLM-administered lands mapped with critical slopes.

- the high drainage density in the Kilchis Frontal, Upper Nestucca, and Upper Willamina watersheds which indicates high potentials for erosion.

- the high precipitation rating and flow rating for the Elk Creek (Nestucca) watershed indicating a high erosive potential in this watershed.

- the very high percentage of most of these watersheds with mapped unstable soils.

The East Fork (Nehalem) is the only selected analytical watershed in Washington and Columbia counties. It has a WCI rating of 50. This watershed is considered to be in better overall condition than over half of the selected analytical watersheds on the district.

The precipitation, flow and landslide ratings for this watershed are low indicating low erosive forces and low susceptibility to landsliding. The key concerns in this watershed are:

- the high amount of land impacted by roads, skid trails and other disturbances which result in increased peak flows and erosion rates.

- the high amount in areas of meadows, pastures, brush, young forests and areas with over 20 percent exposed soils. These conditions make the watershed highly susceptible to erosive forces such as rain, overland flow and landslides.

- the very high amount of land impacted by tractor piling operations which increase compaction, disturbance, peak flows and erosion rates.

- the very high erodibility of the soils.

The selected analytical watersheds in Clackamas County encompass both sides of Table Rock Wilderness. These two watersheds are in good overall condition, with a WCI rating of 35 for the Table Rock Fork and 88 for the Upper Molalla River. Physical conditions are similar. The key concerns in these two watersheds are:

- the high amount of the Upper Molalla River watershed that is impacted by roads, skid trails and other disturbances which cause increased peak flows and erosion rates.

- the very high amount of the Upper Molalla River watershed in areas of meadows, pastures, brush, young forests and areas with over 20 percent exposed soils. These conditions make the watershed highly susceptible to erosive forces such as rain, overland flow and landslides.

- the high amount of both watersheds with slopes greater than 60 percent and/or BLM-administered lands mapped with critical slopes.
- the very high percentage of most of these watersheds with mapped unstable soils.

The Quartzville Creek analytical watershed (64,000 acres) in Marion County is the largest of the Salem District's selected analytical watersheds. It is in the worst overall condition with a WCI rating of 118. In addition to size, it is distinct from the other selected analytical watersheds due to a large percentage of unstable soils, steep slopes and mapped critical slopes on BLM-administered lands. It is the only watershed in the district with a significant amount of placer mining activity. On the upper portions of the watershed, administered by the U. S. Forest Service, there are 30 placer claims where stream dredges are used. There are two claims currently operating under plans of operation, both of which create significant water quality concerns.

The lower portion of the Quartzville Creek drainage is administered by the BLM. It is a designated wild and scenic river. Recreational mining, which is allowed under the designation, is conducted using small dredging equipment and hand tools. This activity in the stream causes a continual disruption of streambed gravels which, together with a lack of large woody debris to provide stream structure, reduces the streams ability to accumulate the spawning gravels and cover needed for many aquatic organisms and fish to thrive.

Appendix 3-H Watershed Condition Index (Current Condition)

Watershed Name	W Analytical Watershed Acres	WB Analytical Watershed Acres BLM	Soil Disturbance Factors: P Paved Roads (Acres)	R Rocked Roads (Acres)	D Dirt Roads (Acres)	S Skid Trails (Acres)	O Other Disturbances (Acres)	SDI Soil Disturbance Rating	Vegetation Type Rating: M Meadow (Grass) (Acres)	P Pasture/ Brush (Acres)	D Disturbed >20% Bare (Acres)	F0 Forest 0-20 Yrs (Acres)	F20+ Forest >20 YRS (Acres)	C 10 Yr Harvest (Acres)	VI Veg Type Rating
Alsea Frontal	41,300	14,200	46	1,569	387	1,337	76	1.44	316	1,445	5,750	3,477	28,227		1.79
Bear Creek	3,900	3,200	0	203	27	75	24	1.37	56	0	255	496	2,821		1.52
Bible Creek	4,800	2,200	21	176	20	160	26	1.43	64	13	411	809	3,210		1.69
Clear Ck (Kilchis)	2,800	1,300	0	105	4	47	14	1.27	28	0	170	398	2,094		1.51
Crooked Creek	9,900	4,400	0	347	132	141	0	1.30	294	59	352	470	8,275		1.31
East Fork Nehalem[3]	14,200	4,400	0	694	79	760	11	1.61	159	0	1,785	2,116	9,341		1.80
Elk Creek (Nestucca)	6,300	5,100	0	254	8	91	32	1.26	39	0	295	986	4,698		1.47
Fall Creek	19,200	5,800	0	796	177	340	0	1.32	213	106	905	2,236	14,920		1.43
Gooseneck Creek	6,200	2,700	0	251	8	204	149	1.46	88	442	1,005	232	4,044		1.87
Kilchis Frontal[2]	2,800	900	0	81	5	35	13	1.21	0	85	127	297	2,206		1.40
Lower Lobster	18,500	6,900	56	652	41	487	122	1.35	14	528	1,442	2,099	13,592		1.55
Lower So Fk Alsea	11,900	6,100	13	502	49	271	250	1.40	163	148	829	918	9,015		1.47
Mill Creek	22,100	9,600	0	697	42	430	33	1.27	392	112	1,702	2,744	16,339		1.58
Moon Creek	12,600	5,400	0	352	21	306	130	1.32	129	129	874	2,278	8,684		1.63
North Fork Alsea	20,700	12,000	0	820	100	585	157	1.40	341	170	1,545	2,283	15,254		1.55
North Fork Siletz[3]	25,300	10,100	0	1,120	60	875	230	1.45	575	0	1,428	3,543	18,363		1.53
Pedee Creek	7,700	2,100	0	309	20	717	70	1.91	0	180	1,196	541	5,352		1.80
Quartzville Creek[1]	64,000	21,200	313	1,560	59	1,782	1,988	1.40	506	0	5,052	11,595	42,942		1.66
Rowell-Gold Creek	10,600	3,100	32	386	26	607	28	1.59	92	152	1,522	1,476	6,894		1.88
Table Rock Fork	23,000	13,800	0	814	48	397	0	1.26	448	0	564	68	16,900		1.16
Testament Creek	4,400	2,900	3	202	13	137	74	1.45	84	12	423	897	2,676		1.80
Upper Lobster	9,100	8,100	0	336	33	202	0	1.31	247	0	480	987	6,995		1.47
Upper Molalla River	22,500	10,800	1	960	86	1,268	94	1.62	367	0	3,358	3,916	13,687		1.96
Upper Nestucca	16,600	11,200	67	699	60	534	11	1.41	78	0	1,688	2,525	11,344		1.69
Upper Rickreall Ck[3]	6,800	2,200	0	186	39	293	0	1.46	388	0	776	259	5,145		1.69
Upper So Fk Alsea	19,700	12,600	68	921	208	447	0	1.39	301	0	1,052	1,462	16,092		1.39
Upper Willamina	25,500	11,200	53	980	85	828	0	1.40	192	178	2,412	3,108	18,648		1.63

[1] Mining factor to approximate impacts from recreational mining as well as notices on USFS.
[2] Subset of larger watershed. Flow and attributes are attributed to mapped analytical watershed and dows not relate to actual flows.
[3] Estimated peak flows from USGS model. Precipitation is outside of the USGS regression range.

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

	Silvicultural Practices					SI	Riparian Rating					RI	Mining Rating		MI
Watershed Name	T Tractor Piling (Acres)	B Burning Recent (Acres)	H Herbicides (Last Year) (Acres)	F Fertilization (10Yr/10) (Acres)	P PCT (5 Yrs) (Acres)	Silvic. Practices Rating	S Seedlings/ Saplings (Acres)	P Pole Timber (Acres)	T Small Saw Timber (Acres)	L Large Saw Timber (Acres)	R Total Riparian (Acres)	Riparian Rating	N Notices (#)	M Stream (Miles)	Mining Rating
Alsea Frontal	211	0	250	15	600	1.06	250	972	2,252	508	3,981	1.44	0	340	1.00
Bear Creek	0	0	0	40	75	1.03	15	15	141	102	273	1.33	0	28	1.00
Bible Creek	90	13	0	0	22	1.16	15	22	89	223	349	1.26	0	31	1.00
Clear Ck (Kilchis)	9	0	0	0	0	1.02	10	6	243	26	285	1.38	0	31	1.00
Crooked Creek	59	0	50	0	100	1.06	20	262	612	138	1,033	1.42	0	70	1.00
East Fork Nehalem[3]	453	73	4,100	498	0	1.96	84	161	434	319	999	1.39	1	88	1.09
Elk Creek (Nestucca)	13	64	0	11	87	1.07	17	136	275	171	600	1.38	0	45	1.00
Fall Creek	227	27	300	20	500	1.15	59	91	888	180	1,217	1.39	0	354	1.00
Gooseneck Creek	77	0	0	151	0	1.13	44	41	279	24	348	1.51	0	84	1.00
Kilchis Frontal[2]	0	0	70	0	0	1.06	17	26	91	117	616	1.13	1	34	1.24
Lower Lobster	86	43	0	0	200	1.05	396	719	948	511	2,434	1.52	0	238	1.00
Lower So Fk Alsea	133	30	0	0	200	1.11	16	240	791	206	1,321	1.37	0	79	1.00
Mill Creek	101	11	0	2	0	1.04	238	121	1,267	414	1,850	1.45	0	148	1.00
Moon Creek	43	0	20	0	104	1.04	26	30	120	539	720	1.22	0	63	1.00
North Fork Alsea	312	0	150	20	400	1.15	37	248	735	960	2,137	1.28	0	145	1.00
North Fork Siletz[3]	352	0	0	430	40	1.13	4	306	1,370	475	2,194	1.35	0	156	1.00
Pedee Creek	399	129	0	4	300	1.48	383	128	467	70	683	1.95	0	48	1.00
Quartzville Creek[1]	625	337	0	0	480	1.10	256	1,258	1,558	228	3,440	1.48	50	451	1.89
Rowell-Gold Creek	518	0	0	3	10	1.37	83	24	472	44	556	1.50	0	142	1.00
Table Rock Fork	399	145	0	74	133	1.16	49	470	724	204	1,635	1.39	0	198	1.00
Testament Creek	48	48	0	0	36	1.13	30	31	219	36	311	1.44	0	42	1.00
Upper Lobster	65	0	0	0	200	1.07	194	254	330	27	648	1.74	0	60	1.00
Upper Molalla River	444	165	0	0	0	1.18	212	625	691	288	1,817	1.49	0	189	1.00
Upper Nestucca	52	196	120	54	273	1.10	91	113	851	868	1,923	1.31	0	256	1.00
Upper Rickreall Ck[3]	117	12	400	0	30	1.27	10	92	405	185	692	1.35	0	46	1.00
Upper So Fk Alsea	123	0	100	0	400	1.07	58	143	1,162	500	1,863	1.35	0	122	1.00
Upper Willamina	296	118	0	0	200	1.11	87	210	1,695	734	2,726	1.35	0	368	1.00

[1] Mining factor to approximate impacts from recreational mining as well as notices on USFS.
[2] Subset of larger watershed. Flow and attributes are attributed to mapped analytical watershed and dows not relate to actual flows.
[3] Estimated peak flows from USGS model. Precipitation is outside of the USGS regression range.

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Soils S1*K1/W Ave K* Factor	KI Soils Rating	Slope/Aspect S Slopes >60% (Acres)	Slope/Aspect A Critical Aspects (Acres)	AI Slope/Aspect Rating	Drainage DD Drainage Density (Mi/Sq Mi)	DI Drainage Density Rating	Precip. P Ave Storm 2Yr-24Hr. (inches)	PI Precip. Rating	Flow Q 2 YRr Flood (cfs/sq. mi.)	FI Flow Rating	Landslide U Unstable Soils (Acres)	LI Land Slide Rating	WCI Watershed Condition Index
Alsea Frontal	0.22	1.76	563	236	1.13	5.270	1.42	4.5	1.56	67.6	1.35	33,318	1.75	41.30
Bear Creek	0.21	1.72	0	293	1.40	4.603	1.37	5.5	1.69	96.5	1.51	3,882	1.90	45.56
Bible Creek	0.24	1.83	2	137	1.27	4.142	1.33	5.5	1.69	100.7	1.53	4,774	1.90	53.19
Clear Ck (Kilchis)	0.25	1.89	168	112	1.62	6.904	1.55	4.5	1.56	76.5	1.40	2,836	1.90	53.54
Crooked Creek	0.19	1.65	242	283	1.39	4.542	1.36	5.0	1.63	89.0	1.47	9,904	1.90	36.24
East Fork Nehalem[3]	0.28	1.97	0	148	1.15	3.954	1.32	2.5	1.31	21.8	1.11	4,076	1.33	49.73
Elk Creek (Nestucca)	0.18	1.62	19	285	1.25	4.542	1.36	6.0	1.75	118.0	1.62	6,322	1.90	40.70
Fall Creek	0.13	1.46	852	306	1.42	11.805	1.94	5.5	1.69	104.0	1.55	19,192	1.90	60.38
Gooseneck Creek	0.24	1.86	287	83	1.33	8.640	1.69	4.0	1.50	69.3	1.36	6,208	1.90	75.61
Kilchis Frontal[2]	0.27	1.94	114	56	1.46	7.642	1.61	4.5	1.56	76.5	1.40	2,478	1.80	45.51
Lower Lobster	0.12	1.43	397	114	1.17	8.216	1.66	5.0	1.63	86.8	1.46	18,534	1.90	41.77
Lower So Fk Alsea	0.22	1.78	219	138	1.18	4.233	1.34	5.0	1.63	88.3	1.46	10,928	1.84	38.14
Mill Creek	0.21	1.72	901	336	1.33	4.282	1.34	5.5	1.69	86.1	1.45	22,082	1.90	43.38
Moon Creek	0.24	1.82	269	1,009	1.91	3.204	1.26	5.5	1.69	105.7	1.55	12,606	1.90	59.23
North Fork Alsea	0.18	1.63	232	413	1.20	4.499	1.36	5.0	1.63	86.4	1.45	20,608	1.90	37.82
North Fork Siletz[3]	0.17	1.58	1,073	947	1.59	3.949	1.32	7.5	1.94	179.9	1.94	25,318	1.90	80.19
Pedee Creek	0.21	1.72	7	84	1.18	3.984	1.32	4.5	1.56	82.4	1.43	6,630	1.79	106.51
Quartzville Creek[1]	0.13	1.44	6,674	2,546	1.98	4.505	1.36	5.0	1.63	74.9	1.39	64,038	1.90	118.23
Rowell-Gold Creek	0.19	1.66	361	63	1.24	8.537	1.68	5.5	1.69	111.4	1.58	10,596	1.90	107.84
Table Rock Fork	0.14	1.49	1,298	1,954	1.86	5.508	1.44	4.0	1.50	58.5	1.31	22,672	1.89	34.73
Testament Creek	0.17	1.61	28	224	1.36	6.063	1.49	5.5	1.69	110.3	1.58	4,398	1.90	69.63
Upper Lobster	0.14	1.48	563	362	1.47	4.209	1.34	5.5	1.69	107.1	1.56	9,060	1.90	52.30
Upper Molalla River	0.14	1.47	1,456	1,387	1.84	5.380	1.43	4.5	1.56	71.7	1.38	22,482	1.90	88.17
Upper Nestucca	0.17	1.60	94	404	1.18	9.890	1.79	5.5	1.69	82.1	1.43	16,620	1.90	53.38
Upper Rickreall Ck[3]	0.17	1.60	191	265	1.64	4.339	1.35	6.0	1.75	137.1	1.72	6,766	1.90	85.88
Upper So Fk Alsea	0.20	1.70	88	69	1.04	3.958	1.32	4.5	1.56	70.8	1.37	19,726	1.90	26.45
Upper Willamina	0.22	1.78	37	538	1.21	9.249	1.74	4.5	1.56	70.5	1.37	25,474	1.90	52.16

[1] Mining factor to approximate impacts from recreational mining as well as notices on USFS.
[2] Subset of larger watershed. Flow and attributes are attributed to mapped analytical watershed and dows not relate to actual flows.
[3] Estimated peak flows from USGS model. Precipitation is outside of the USGS regression range.

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

WCI for Pvt. Actions Only (No BLM Activity)

			Soil Disturbance Factors					SDI	Vegetation Type Rating							VI
Watershed Name	Analytical Watershed Acres	Analytical Watershed Acres BLM	P Paved Roads (Acres)	R(+10) Rocked Roads (Acres)	D(+10) Dirt Roads (Acres)	S(+10) Skid Trails (Acres)	O Other Disturbances (Acres)	Soil Disturbance Rating	M Meadow (Grass) (Acres)	P Pasture/ Brush (Acres)	D Disturbed >20% Bare (Acres)	F(0-3) Forest 0-3 Yrs (Acres-All)	F(4-8) Forest 4-8 YRS (Acres-All)	F(0+10) Forest 10-20 YRS (Acres-All)	F(20+10) Forest >20 YRS (Acres)	Veg Type Rating
Alsea Frontal	41,309	14,206	46	1,569	387	1,264	76	1.42	316	1,445	5,750	308	308	1739	29349	1.72
Bear Creek (Salem)	3,899	3,172	0	194	27	71	34	1.36	56	0	255	25	25	248	3018	1.40
Bible Creek	4,762	2,204	21	176	20	144	26	1.40	64	13	411	17	17	405	3581	1.49
Clear Ck (Kilchis)	2,834	1,341	0	120	4	90	14	1.41	28	0	170	285	285	199	1722	1.84
Crooked Creek	9,895	4,419	0	348	132	132	0	1.29	294	59	352	32	32	235	8447	1.27
East Fork Nehalem	14,244	4,353	0	706	80	970	11	1.73	159	0	1,785	906	906	1058	8587	1.94
Elk Creek (Nestucca)	6,326	5,127	0	254	8	97	32	1.27	39	0	295	134	134	493	4922	1.38
Fall Creek	19,193	5,789	0	803	178	331	0	1.32	213	106	905	159	159	1118	15720	1.32
Gooseneck Creek	6,221	2,726	0	254	8	213	149	1.48	88	442	1,005	149	149	116	3862	1.94
Kilchis Frontal	2,814	854	0	94	6	158	13	1.58	0	85	127	242	242	149	1871	1.70
Lower Lobster	18,547	6,856	56	661	41	468	122	1.34	14	528	1,442	207	207	1050	14228	1.47
Lower So Fk Alsea	11,886	6,126	13	508	50	294	250	1.42	163	148	829	142	142	459	9191	1.44
Mill Creek	22,062	9,561	0	707	42	2,220	33	1.92	392	112	1,702	2022	2022	1372	13667	1.89
Moon Creek	12,593	5,392	0	365	21	373	130	1.37	129	129	874	514	514	1139	8795	1.61
North Fork Alsea	20,670	11,960	0	830	101	663	157	1.43	341	170	1,545	695	695	1142	15005	1.58
North Fork Siletz	25,320	10,149	0	1,131	60	1,427	230	1.63	575	0	1,428	1668	1668	1772	16798	1.68
Pedee Creek	7,685	2,119	0	336	21	766	70	1.97	0	180	1,196	857	857	271	3909	2.27
Quartzville Creek	64,041	21,228	313	1,560	59	1,574	1988	1.37	506	0	5,052	62	62	5798	48616	1.43
Rowell-Gold Creek	10,609	3,145	32	397	27	566	28	1.57	92	152	1,522	130	130	738	7371	1.76
Table Rock Fork	22,956	13,838	0	821	49	623	0	1.34	448	0	564	1353	1353	34	14228	1.45
Testament Creek	4,406	2,909	3	202	13	122	74	1.43	84	12	423	11	11	449	3102	1.55
Upper Lobster	9,063	8,077	0	336	33	180	0	1.29	247	0	480	11	11	494	7466	1.34
Upper Molalla River	22,469	10,842	1	983	88	1,438	94	1.68	367	0	3,358	1105	1105	1958	13434	1.99
Upper Nestucca	16,596	11,235	67	720	61	623	11	1.46	78	0	1,688	669	669	1263	11269	1.71
Upper Rickreall Ck	6,778	2,210	0	214	43	595	0	1.84	388	0	776	710	710	130	3854	2.17
Upper So Fk Alsea	19,742	12,576	68	921	208	429	0	1.38	301	0	1,052	134	134	731	16555	1.33
Upper Willamina	25,486	11,231	53	985	85	793	0	1.39	192	178	2,412	254	254	1554	19694	1.53

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	T(+10) Tractor Piling (Acres)	Silvicultural Practices B(+10) Burning Recent (Acres)	H Herbicides (Last Year) (Acres)	F Fertilization (10Yr/10) (Acres)	P PCT (5 Yrs) (Acres)	SI Silvic. Practices Rating	S(+10) Seedlings/ Saplings (Acres + I/O)	RIPARIAN RATING P(+10) Pole Timber (Acres + I/O)	T(+10) Small Saw Timber (Acres + I/O)	L(+10) Large Saw Timber (Acres + I/O)	R Total Riparian (Acres)	RI Riparian Rating
Alsea Frontal	229	60	250	15	600	1.07	215	898	2294	741	3981	1.43
Bear Creek (Salem)	0	5	0	40	75	1.03	10	26	128	119	273	1.33
Bible Creek	93	3	0	0	22	1.15	10	30	85	234	349	1.26
Clear Ck (Kilchis)	18	56	0	0	0	1.12	75	14	202	0	285	1.56
Crooked Creek	64	6	50	0	100	1.07	17	195	623	211	1033	1.39
East Fork Nehalem	664	160	4,100	498	0	2.09	194	192	434	235	999	1.51
Elk Creek (Nestucca)	16	27	0	11	87	1.05	26	108	286	192	600	1.37
Fall Creek	250	29	300	20	500	1.16	63	120	807	267	1217	1.39
Gooseneck Creek	99	28	0	151	0	1.17	9	31	258	53	348	1.38
Kilchis Frontal	139	34	70	0	0	1.47	298	401	88	85	616	1.96
Lower Lobster	102	40	0	0	200	1.06	205	736	1069	595	2434	1.47
Lower So Fk Alsea	182	23	0	0	200	1.13	95	243	772	266	1321	1.43
Mill Creek	2654	149	0	2	0	1.93	274	130	1149	330	1850	1.45
Moon Creek	81	99	20	0	104	1.09	102	51	115	472	720	1.33
North Fork Alsea	374	133	150	20	400	1.19	296	359	726	885	2137	1.42
North Fork Siletz	893	280	0	430	40	1.33	270	248	1301	405	2194	1.44
Pedee Creek	399	171	0	4	300	1.50	150	103	441	0	683	1.56
Quartzville Creek	628	12	0	0	480	1.08	266	1235	1782	421	3440	1.51
Rowell-Gold Creek	544	24	0	3	10	1.39	20	33	421	94	556	1.38
Table Rock Fork	470	263	0	74	133	1.21	423	551	790	30	1635	1.65
Testament Creek	48	2	0	0	36	1.09	17	46	202	63	311	1.42
Upper Lobster	67	2	0	0	200	1.07	26	207	374	67	648	1.47
Upper Molalla River	580	207	0	0	0	1.23	311	630	813	205	1817	1.57
Upper Nestucca	69	132	120	54	273	1.09	118	167	782	917	1923	1.33
Upper Rickreall Ck	278	126	400	0	30	1.51	124	72	385	118	692	1.47
Upper So Fk Alsea	136	25	100	0	400	1.08	54	154	1065	630	1863	1.34
Upper Willamina	325	48	0	0	200	1.11	98	227	1553	907	2726	1.34

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Mining Rating N Notices (#)	M Stream (Miles)	MI Mining Rating	Soils S1*K1/W Ave K* Factor	KI Soils Rating	Slope/Aspect S Slopes >60% (Acres)	A Critical Aspects (Acres)	AI Slope/ Aspect Rating	Drainage DD Drainage Density (Mi/Sq Mi)	DI Drainage Density Rating	Precip P Ave Storm 2Yr-24Hr. (inches)	PI Precip Rating
Alsea Frontal	0	340	1.00	0.22	1.76	563	236	1.13	5.270	1.42	4.5	1.56
Bear Creek (Salem)	0	28	1.00	0.21	1.72	0	293	1.40	4.603	1.37	5.5	1.69
Bible Creek	0	31	1.00	0.24	1.83	2	137	1.27	4.142	1.33	5.5	1.69
Clear Ck (Kilchis)	0	31	1.00	0.25	1.89	168	112	1.62	6.904	1.55	4.5	1.56
Crooked Creek	0	70	1.00	0.19	1.65	242	283	1.39	4.542	1.36	5.0	1.63
East Fork Nehalem	1	88	1.09	0.28	1.97	0	148	1.15	3.954	1.32	2.5	1.31
Elk Creek (Nestucca)	0	45	1.00	0.18	1.62	19	285	1.25	4.542	1.36	6.0	1.75
Fall Creek	0	354	1.00	0.13	1.46	852	306	1.42	11.805	1.94	5.5	1.69
Gooseneck Creek	0	84	1.00	0.24	1.86	287	83	1.33	8.640	1.69	4.0	1.50
Kilchis Frontal	1	34	1.24	0.27	1.94	114	56	1.46	7.642	1.61	4.5	1.56
Lower Lobster	0	238	1.00	0.12	1.43	397	114	1.17	8.216	1.66	5.0	1.63
Lower So Fk Alsea	0	79	1.00	0.22	1.78	219	138	1.18	4.233	1.34	5.0	1.63
Mill Creek	0	148	1.00	0.21	1.72	901	336	1.33	4.282	1.34	5.5	1.69
Moon Creek	0	63	1.00	0.24	1.82	269	1,009	1.91	3.204	1.26	5.5	1.69
North Fork Alsea	0	145	1.00	0.18	1.63	232	413	1.20	4.499	1.36	5.0	1.63
North Fork Siletz	0	156	1.00	0.17	1.58	1,073	947	1.59	3.949	1.32	7.5	1.94
Pedee Creek	0	48	1.00	0.21	1.72	7	84	1.18	3.984	1.32	4.5	1.56
Quartzville Creek	50	451	1.89	0.13	1.44	6,674	2,546	1.98	4.505	1.36	5.0	1.63
Rowell-Gold Creek	0	142	1.00	0.19	1.66	361	63	1.24	8.537	1.68	5.5	1.69
Table Rock Fork	0	198	1.00	0.14	1.49	1,298	1,954	1.86	5.508	1.44	4.0	1.50
Testament Creek	0	42	1.00	0.17	1.61	28	224	1.36	6.063	1.49	5.5	1.69
Upper Lobster	0	60	1.00	0.14	1.48	563	362	1.47	4.209	1.34	5.5	1.69
Upper Molalla River	0	189	1.00	0.14	1.47	1,456	1,387	1.84	5.380	1.43	4.5	1.56
Upper Nestucca	0	256	1.00	0.17	1.60	94	404	1.18	9.890	1.79	5.5	1.69
Upper Rickreall Ck	0	46	1.00	0.17	1.60	191	265	1.64	4.339	1.35	6.0	1.75
Upper So Fk Alsea	0	122	1.00	0.20	1.70	88	69	1.04	3.958	1.32	4.5	1.56
Upper Willamina	0	368	1.00	0.22	1.78	37	538	1.21	9.249	1.74	4.5	1.56

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Flow Q 2 Yr. Flood (cfs/sq. mi.)	FI Flow Rating	Landslide U Unstable Soils (Acres)	LI Land Slide Rating	WCI (PVT) Future Watershed Condition Index	WCI Current Watershed Condition Index
Alsea Frontal	67.6	1.35	33,318	1.75	39.4	41.3
Bear Creek (Salem)	96.5	1.51	3,882	1.90	41.6	45.6
Bible Creek	100.7	1.53	4,774	1.90	46.0	53.2
Clear Ck (Kilchis)	76.5	1.40	2,836	1.90	89.8	53.5
Crooked Creek	89.0	1.47	9,904	1.90	34.3	36.2
East Fork Nehalem	21.8	1.11	4,076	1.33	66.6	49.7
Elk Creek (Nestucca)	118.0	1.62	6,322	1.90	37.7	40.7
Fall Creek	104.0	1.55	19,192	1.90	56.4	60.4
Gooseneck Creek	69.3	1.36	6,208	1.90	75.1	75.6
Kilchis Frontal	76.5	1.40	2,478	1.80	173.4	45.5
Lower Lobster	86.8	1.46	18,534	1.90	38.1	41.8
Lower So Fk Alsea	88.3	1.46	10,928	1.84	40.3	38.1
Mill Creek	86.1	1.45	22,082	1.90	145.0	43.4
Moon Creek	105.7	1.55	12,606	1.90	69.2	59.2
North Fork Alsea	86.4	1.45	20,608	1.90	45.8	37.8
North Fork Siletz	179.9	1.94	25,318	1.90	124.4	80.2
Pedee Creek	82.4	1.43	6,630	1.79	112.5	106.5
Quartzville Creek	74.9	1.39	64,038	1.90	100.7	118.2
Rowell-Gold Creek	111.4	1.58	10,596	1.90	92.9	107.8
Table Rock Fork	58.5	1.31	22,672	1.89	57.0	34.7
Testament Creek	110.3	1.58	4,398	1.90	56.3	69.6
Upper Lobster	107.1	1.56	9,060	1.90	39.7	52.3
Upper Molalla River	71.7	1.38	22,482	1.90	102.1	88.2
Upper Nestucca	82.1	1.43	16,620	1.90	56.1	53.4
Upper Rickreall Ck	137.1	1.72	6,766	1.90	179.7	85.9
Upper So Fk Alsea	70.8	1.37	19,726	1.90	25.2	26.4
Upper Willamina	70.5	1.37	25,474	1.90	48.3	52.2

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

WCI Alternative A

			Soil Disturbance Factors					SDi	Vegetation Type Rating							VI
Watershed Name	Analytical Watershed Acres	Analytical Watershed Acres BLM	P Paved Roads (Acres)	R(+10) Rocked Roads (Acres)	D(+10) Dirt Roads (Acres)	S(+10) Skid Trails (Acres)	O Other Disturbances (Acres)	Soil Disturbance Rating	M Meadow (Grass) (Acres)	P Pasture/ Brush (Acres)	D Disturbed >20% Bare (Acres)	F(0-3) Forest 0-3 Yrs (Acres-All)	F(4-8) Forest 4-8 YRS (Acres-All)	F(0+10) Forest 10-20 YRS (Acres-All)	F(20+10) Forest >20 YRS (Acres)	Veg Type Rating
Alsea Frontal	41,309	14,206	46	1,585	387	1,462	76	1.46	316	1,445	5,750	2005	308	1739	27652	1.84
Bear Creek (Salem)	3,899	3,172	0	195	27	103	34	1.43	56	0	255	972	25	248	2071	2.11
Bible Creek	4,762	2,204	21	178	20	152	26	1.41	64	13	411	240	17	405	3358	1.63
Clear Ck (Kilchis)	2,834	1,341	0	120	5	102	14	1.44	28	0	170	644	285	199	1363	2.22
Crooked Creek	9,895	4,419	0	348	132	132	0	1.29	294	59	352	32	32	235	8447	1.27
East Fork Nehalem	14,244	4,353	0	706	80	971	11	1.73	159	0	1,785	948	906	1058	8545	1.95
Elk Creek (Nestucca)	6,326	5,127	0	257	8	136	32	1.32	39	0	295	1275	134	493	3781	1.91
Fall Creek	19,193	5,789	0	813	178	449	0	1.37	213	106	905	1177	159	1118	14702	1.48
Gooseneck Creek	6,221	2,726	0	255	8	216	149	1.48	88	442	1,005	225	149	116	3786	1.98
Kilchis Frontal	2,814	854	0	95	6	167	13	1.60	0	85	127	473	242	149	1640	1.95
Lower Lobster	18,547	6,856	56	681	41	555	122	1.39	14	528	1,442	1873	207	1050	12562	1.73
Lower So Fk Alsea	11,886	6,126	13	521	50	336	250	1.45	163	148	829	1025	142	459	8308	1.65
Mill Creek	22,062	9,561	0	714	42	2,249	33	1.93	392	112	1,702	2902	2022	1372	12787	2.01
Moon Creek	12,593	5,392	0	368	21	413	130	1.39	129	129	874	1810	514	1139	7499	1.91
North Fork Alsea	20,670	11,960	0	845	101	722	157	1.45	341	170	1,545	1794	695	1142	13906	1.74
North Fork Siletz	25,320	10,149	0	1,138	60	1,451	230	1.63	575	0	1,428	2482	1668	1772	15984	1.78
Pedee Creek	7,685	2,119	0	339	22	787	70	2.00	0	180	1,196	1478	857	271	3288	2.51
Quartzville Creek	64,041	21,228	313	1,583	59	1,786	1988	1.40	506	0	5,052	6082	62	5798	42596	1.71
Rowell-Gold Creek	10,609	3,145	32	397	27	575	28	1.57	92	152	1,522	469	130	738	7032	1.86
Table Rock Fork	22,956	13,838	0	833	50	698	0	1.37	448	0	564	3310	1353	34	12271	1.70
Testament Creek	4,406	2,909	3	203	13	150	74	1.48	84	12	423	839	11	449	2274	2.11
Upper Lobster	9,063	8,077	0	347	33	232	0	1.34	247	0	480	998	11	494	6479	1.66
Upper Molalla River	22,469	10,842	1	987	88	1,458	94	1.69	367	0	3,358	1803	1105	1958	12736	2.08
Upper Nestucca	16,596	11,235	67	724	61	699	11	1.50	78	0	1,688	3156	669	1263	8782	2.15
Upper Rickreall Ck	6,778	2,210	0	214	43	595	0	1.84	388	0	776	710	710	130	3854	2.17
Upper So Fk Alsea	19,742	12,576	68	935	208	521	0	1.42	301	0	1,052	1606	134	731	15083	1.55
Upper Willamina	25,486	11,231	53	996	85	868	0	1.41	192	178	2,412	2730	254	1554	17218	1.81

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

		Silvicultural Practices				SI		RIPARIAN RATING				RI
Watershed Name	T(+10) Tractor Piling (Acres)	B(+10) Burning Recent (Acres)	H Herbicides (Last Year) (Acres)	F Fertilization (10Yr/10) (Acres)	P PCT (5 Yrs) (Acres)	S(+10) Silvic. Practices Rating	P(+10) Seedlings/ Saplings (Acres + I/O)	T(+10) Pole Timber (Acres + I/O)	L(+10) Small Saw Timber (Acres + I/O)	R Large Saw Timber (Acres + I/O)	Total Riparian (Acres)	Riparian Rating
Alsea Frontal	279	389	250	15	600	1.11	224	898	2294	732	3981	1.44
Bear Creek (Salem)	0	194	0	40	75	1.22	13	26	128	116	273	1.34
Bible Creek	109	44	0	0	22	1.21	13	30	85	232	349	1.26
Clear Ck (Kilchis)	24	127	0	0	0	1.23	78	14	202	0	285	1.57
Crooked Creek	64	6	50	0	100	1.07	17	195	623	211	1033	1.39
East Fork Nehalem	669	168	4,100	498	0	2.10	194	192	434	235	999	1.51
Elk Creek (Nestucca)	27	252	0	11	87	1.20	34	108	286	184	600	1.39
Fall Creek	325	218	300	20	500	1.23	67	120	807	263	1217	1.39
Gooseneck Creek	104	42	0	151	0	1.19	9	31	258	53	348	1.38
Kilchis Frontal	205	67	70	0	0	1.69	298	401	88	85	616	1.96
Lower Lobster	165	360	0	0	200	1.15	213	736	1069	588	2434	1.47
Lower So Fk Alsea	334	170	0	0	200	1.28	116	243	772	245	1321	1.45
Mill Creek	3209	214	0	2	0	2.13	288	130	1149	317	1850	1.45
Moon Creek	129	349	20	0	104	1.19	112	51	115	462	720	1.34
North Fork Alsea	422	343	150	20	400	1.25	304	359	726	877	2137	1.43
North Fork Siletz	1025	416	0	430	40	1.39	274	248	1301	401	2194	1.44
Pedee Creek	399	296	0	4	300	1.56	152	103	441	0	683	1.56
Quartzville Creek	784	1185	0	0	480	1.17	297	1235	1782	390	3440	1.52
Rowell-Gold Creek	577	85	0	3	10	1.44	24	33	421	90	556	1.38
Table Rock Fork	521	645	0	74	133	1.28	423	551	790	29	1635	1.65
Testament Creek	60	166	0	0	36	1.25	22	46	202	58	311	1.43
Upper Lobster	148	183	0	0	200	1.21	37	207	374	56	648	1.48
Upper Molalla River	623	338	0	0	0	1.26	311	630	813	205	1817	1.57
Upper Nestucca	99	623	120	54	273	1.22	144	167	782	892	1923	1.34
Upper Rickreall Ck	278	126	400	0	30	1.51	124	72	385	118	692	1.47
Upper So Fk Alsea	209	305	100	0	400	1.16	71	154	1065	613	1863	1.35
Upper Willamina	464	515	0	0	200	1.22	116	227	1553	889	2726	1.35

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Mining Rating N Notices (#)	M Stream (Miles)	MI Mining Rating	Soils S1*K1/W Ave K* Factor	Ki Soils Rating	Slope/Aspect S Slopes >60% (Acres)	A Critical Aspects (Acres)	AI Slope/ Aspect Rating	Drainage DD Drainage Density (Mi/Sq Mi)	DI Drainage Density Rating	Precip P Ave Storm 2Yr-24Hr. (Inches)	PI Precip Rating
Alsea Frontal	0	340	1.00	0.22	1.76	563	236	1.13	5.270	1.42	4.5	1.56
Bear Creek (Salem)	0	28	1.00	0.21	1.72	0	293	1.40	4.603	1.37	5.5	1.69
Bible Creek	0	31	1.00	0.24	1.83	2	137	1.27	4.142	1.33	5.5	1.69
Clear Ck (Kilchis)	0	31	1.00	0.25	1.89	168	112	1.62	6.904	1.55	4.5	1.56
Crooked Creek	0	70	1.00	0.19	1.65	242	283	1.39	4.542	1.36	5.0	1.63
East Fork Nehalem	1	88	1.09	0.28	1.97	0	148	1.15	3.954	1.32	2.5	1.31
Elk Creek (Nestucca)	0	45	1.00	0.18	1.62	19	285	1.25	4.542	1.36	6.0	1.75
Fall Creek	0	354	1.00	0.13	1.46	852	306	1.42	11.805	1.94	5.5	1.69
Gooseneck Creek	0	84	1.00	0.24	1.86	287	83	1.33	8.640	1.69	4.0	1.50
Kilchis Frontal	1	34	1.24	0.27	1.94	114	56	1.46	7.642	1.61	4.5	1.56
Lower Lobster	0	238	1.00	0.12	1.43	397	114	1.17	8.216	1.66	5.0	1.63
Lower So Fk Alsea	0	79	1.00	0.22	1.78	219	138	1.18	4.233	1.34	5.0	1.63
Mill Creek	0	148	1.00	0.21	1.72	901	336	1.33	4.282	1.34	5.5	1.69
Moon Creek	0	63	1.00	0.24	1.82	269	1,009	1.91	3.204	1.26	5.5	1.69
North Fork Alsea	0	145	1.00	0.18	1.63	232	413	1.20	4.499	1.36	5.0	1.63
North Fork Siletz	0	156	1.00	0.17	1.58	1,073	947	1.59	3.949	1.32	7.5	1.94
Pedee Creek	0	48	1.00	0.21	1.72	7	84	1.18	3.984	1.32	4.5	1.56
Quartzville Creek	50	451	1.89	0.13	1.44	6,674	2,546	1.98	4.505	1.36	5.0	1.63
Rowell-Gold Creek	0	142	1.00	0.19	1.66	361	63	1.24	8.537	1.68	5.5	1.69
Table Rock Fork	0	198	1.00	0.14	1.49	1,298	1,954	1.86	5.508	1.44	4.0	1.50
Testament Creek	0	42	1.00	0.17	1.61	28	224	1.36	6.063	1.49	5.5	1.69
Upper Lobster	0	60	1.00	0.14	1.48	563	362	1.47	4.209	1.34	5.5	1.69
Upper Molalla River	0	189	1.00	0.14	1.47	1,456	1,387	1.84	5.380	1.43	4.5	1.56
Upper Nestucca	0	256	1.00	0.17	1.60	94	404	1.18	9.890	1.79	5.5	1.69
Upper Rickreall Ck	0	46	1.00	0.17	1.60	191	265	1.64	4.339	1.35	6.0	1.75
Upper So Fk Alsea	0	122	1.00	0.20	1.70	88	69	1.04	3.958	1.32	4.5	1.56
Upper Willamina	0	368	1.00	0.22	1.78	37	538	1.21	9.249	1.74	4.5	1.56

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Flow Q 2 Yr. Flood (cfs/sq. mi.)	FI Flow Rating	Landslide U Unstable Soils (Acres)	LI Land Slide Rating	WCI (A) Future Watershed Condition Index	WCI (PVT) Future Watershed Condition Index	WCI Current Watershed Condition Index
Alsea Frontal	67.6	1.35	33,318	1.75	45.0	39.4	41.4
Bear Creek (Salem)	96.5	1.51	3,882	1.90	78.1	41.6	45.6
Bible Creek	100.7	1.53	4,774	1.90	53.6	46.0	53.2
Clear Ck (Kilchis)	76.5	1.40	2,836	1.90	122.0	89.2	53.5
Crooked Creek	89.0	1.47	9,904	1.90	34.3	34.3	36.4
East Fork Nehalem	21.8	1.11	4,076	1.33	67.1	66.5	49.7
Elk Creek (Nestucca)	118.0	1.62	6,322	1.90	62.3	37.7	40.7
Fall Creek	104.0	1.55	19,192	1.90	69.3	56.4	60.4
Gooseneck Creek	69.3	1.36	6,208	1.90	77.7	75.1	75.6
Kilchis Frontal	76.5	1.40	2,478	1.80	231.5	172.5	45.4
Lower Lobster	86.8	1.46	18,534	1.90	50.4	38.1	41.8
Lower So Fk Alsea	88.3	1.46	10,928	1.84	54.0	40.3	38.1
Mill Creek	86.1	1.45	22,082	1.90	171.7	144.9	43.4
Moon Creek	105.7	1.55	12,606	1.90	92.5	69.2	59.2
North Fork Alsea	86.4	1.45	20,608	1.90	53.7	45.8	37.8
North Fork Siletz	179.9	1.94	25,318	1.90	138.2	124.4	80.2
Pedee Creek	82.4	1.43	6,630	1.79	131.0	112.2	106.5
Quartzville Creek	74.9	1.39	64,038	1.90	133.1	100.7	118.2
Rowell-Gold Creek	111.4	1.58	10,596	1.90	101.9	92.8	107.8
Table Rock Fork	58.5	1.31	22,672	1.89	72.8	57.0	34.7
Testament Creek	110.3	1.58	4,398	1.90	91.5	56.3	69.6
Upper Lobster	107.1	1.56	9,060	1.90	58.4	39.7	52.3
Upper Molalla River	71.7	1.38	22,482	1.90	110.4	101.9	88.2
Upper Nestucca	82.1	1.43	16,620	1.90	81.4	56.0	53.4
Upper Rickreall Ck	137.1	1.72	6,766	1.90	179.7	178.8	85.9
Upper So Fk Alsea	70.8	1.37	19,726	1.90	32.7	25.2	26.4
Upper Willamina	70.5	1.37	25,474	1.90	64.4	48.3	52.2

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

WCI Alternative B

			Soil Disturbance Factors					SDI	Vegetation Type Rating							VI
Watershed Name	Analytical Watershed Acres	Analytical Watershed Acres BLM	P Paved Roads (Acres)	R(+10) Rocked Roads (Acres)	D(+10) Dirt Roads (Acres)	S(+10) Skid Trails (Acres)	O Other Disturbances (Acres)	Soil Disturbance Rating	M Meadow (Grass) (Acres)	P Pasture/ Brush (Acres)	D Disturbed >20% Bare (Acres)	F(0-3) Forest 0-3 Yrs (Acres-All)	F(4-8) Forest 4-8 YRS (Acres-All)	F(0+10) Forest 10-20 YRS (Acres-All)	F(20+10) Forest >20 YRS (Acres)	Veg Type Rating
Alsea Frontal	41,309	14,206	46	1,591	387	1,372	76	1.44	316	1,445	5,750	2645	308	1739	27012	1.89
Bear Creek (Salem)	3,899	3,172	0	195	27	92	34	1.41	56	0	255	663	25	248	2380	1.88
Bible Creek	4,762	2,204	21	178	20	151	26	1.41	64	13	411	205	17	405	3393	1.61
Clear Ck (Kilchis)	2,834	1,341	0	120	5	96	14	1.42	28	0	170	553	285	199	1454	2.12
Crooked Creek	9,895	4,419	0	348	132	133	0	1.29	294	59	352	47	32	235	8432	1.27
East Fork Nehalem	14,244	4,353	0	706	80	971	11	1.73	159	0	1,785	949	906	1058	8544	1.95
Elk Creek (Nestucca)	6,326	5,127	0	258	8	134	32	1.31	39	0	295	1210	134	493	3846	1.88
Fall Creek	19,193	5,789	0	808	178	389	0	1.34	213	106	905	1208	159	1118	14671	1.48
Gooseneck Creek	6,221	2,726	0	254	8	216	149	1.48	88	442	1,005	239	149	116	3772	1.98
Kilchis Frontal	2,814	854	0	95	6	170	13	1.61	0	85	127	555	242	149	1558	2.03
Lower Lobster	18,547	6,856	56	673	41	549	122	1.38	14	528	1,442	1698	207	1050	12737	1.70
Lower So Fk Alsea	11,886	6,126	13	523	50	357	250	1.46	163	148	829	1360	142	459	7973	1.74
Mill Creek	22,062	9,561	0	711	42	2,242	33	1.93	392	112	1,702	2578	2022	1372	13111	1.96
Moon Creek	12,593	5,392	0	366	21	394	130	1.38	129	129	874	1174	514	1139	8135	1.77
North Fork Alsea	20,670	11,960	0	850	101	755	157	1.47	341	170	1,545	2603	695	1142	13097	1.85
North Fork Siletz	25,320	10,149	0	1,135	60	1,448	230	1.63	575	0	1,428	2353	1668	1772	16113	1.76
Pedee Creek	7,685	2,119	0	337	22	776	70	1.98	0	180	1,196	1135	857	271	3631	2.38
Quartzville Creek	64,041	21,228	313	1,580	59	1,784	1988	1.40	506	0	5,052	5708	62	5798	42970	1.69
Rowell-Gold Creek	10,609	3,145	32	397	27	573	28	1.57	92	152	1,522	359	130	738	7142	1.83
Table Rock Fork	22,956	13,838	0	832	49	693	0	1.36	448	0	564	3314	1353	34	12267	1.70
Testament Creek	4,406	2,909	3	202	13	146	74	1.47	84	12	423	731	11	449	2382	2.03
Upper Lobster	9,063	8,077	0	343	33	207	0	1.32	247	0	480	557	11	494	6920	1.52
Upper Molalla River	22,469	10,842	1	986	88	1,474	94	1.69	367	0	3,358	2020	1105	1958	12519	2.11
Upper Nestucca	16,596	11,235	67	724	62	686	11	1.49	78	0	1,688	2618	669	1263	9320	2.05
Upper Rickreall Ck	6,778	2,210	0	214	43	595	0	1.84	388	0	776	710	710	130	3854	2.17
Upper So Fk Alsea	19,742	12,576	68	930	208	491	0	1.41	301	0	1,052	1124	134	731	15565	1.47
Upper Willamina	25,486	11,231	53	992	86	867	0	1.41	192	178	2,412	2510	254	1554	17438	1.79

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

	Silvicultural Practices					SI	RIPARIAN RATING					RI
Watershed Name	T(+10) Tractor Piling (Acres)	B(+10) Burning Recent (Acres)	H Herbicides (Last Year) (Acres)	F Fertilization (10Yr/10) (Acres)	P PCT (5 Yrs) (Acres)	Silvic. Practices Rating	S(+10) Seedlings/ Saplings (Acres + I/O)	P(+10) Pole Timber (Acres + I/O)	T(+10) Small Saw Timber (Acres + I/O)	L(+10) Large Saw Timber (Acres + I/O)	R Total Riparian (Acres)	Riparian Rating
Alsea Frontal	297	514	250	15	600	1.13	215	898	2294	741	3981	1.43
Bear Creek (Salem)	0	133	0	40	75	1.16	10	26	128	119	273	1.33
Bible Creek	107	38	0	0	22	1.20	10	30	85	234	349	1.26
Clear Ck (Kilchis)	22	109	0	0	0	1.20	75	14	202	0	285	1.56
Crooked Creek	65	9	50	0	100	1.07	17	195	623	211	1033	1.39
East Fork Nehalem	669	168	4,100	498	0	2.10	194	192	434	235	999	1.51
Elk Creek (Nestucca)	27	240	0	11	87	1.19	26	108	286	192	600	1.37
Fall Creek	327	224	300	20	500	1.23	63	120	807	267	1217	1.39
Gooseneck Creek	105	44	0	151	0	1.19	9	31	258	53	348	1.38
Kilchis Frontal	229	79	70	0	0	1.77	298	401	88	85	616	1.96
Lower Lobster	159	327	0	0	200	1.14	205	736	1069	595	2434	1.47
Lower So Fk Alsea	392	225	0	0	200	1.33	95	243	772	266	1321	1.43
Mill Creek	3005	190	0	2	0	2.05	274	130	1149	330	1850	1.45
Moon Creek	106	226	20	0	104	1.14	102	51	115	472	720	1.33
North Fork Alsea	458	498	150	20	400	1.29	296	359	726	885	2137	1.42
North Fork Siletz	1004	394	0	430	40	1.38	270	248	1301	405	2194	1.44
Pedee Creek	399	227	0	4	300	1.53	150	103	441	0	683	1.56
Quartzville Creek	774	1112	0	0	480	1.16	266	1235	1782	421	3440	1.51
Rowell-Gold Creek	566	65	0	3	10	1.42	20	33	421	94	556	1.38
Table Rock Fork	521	645	0	74	133	1.28	423	551	790	30	1635	1.65
Testament Creek	58	144	0	0	36	1.23	17	46	202	63	311	1.42
Upper Lobster	112	102	0	0	200	1.15	26	207	374	67	648	1.47
Upper Molalla River	637	379	0	0	0	1.28	311	630	813	205	1817	1.57
Upper Nestucca	93	517	120	54	273	1.19	118	167	782	917	1923	1.33
Upper Rickreall Ck	278	126	400	0	30	1.51	124	72	385	118	692	1.47
Upper So Fk Alsea	185	214	100	0	400	1.14	54	154	1065	630	1863	1.34
Upper Willamina	452	474	0	0	200	1.21	98	227	1553	907	2726	1.34

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Mining Rating N Notices (#)	M Stream (Miles)	MI Mining Rating	Soils S1*K1/W Ave K* Factor	KI Soils Rating	Slope/Aspect S Slopes >60% (Acres)	A Critical Aspects (Acres)	AI Slope/Aspect Rating	Drainage DD Drainage Density (Mi/Sq Mi)	DI Drainage Density Rating	Precip P Ave Storm 2Yr-24Hr. (inches)	PI Precip Rating
Alsea Frontal	0	340	1.00	0.22	1.76	563	236	1.13	5.270	1.42	4.5	1.56
Bear Creek (Salem)	0	28	1.00	0.21	1.72	0	293	1.40	4.603	1.37	5.5	1.69
Bible Creek	0	31	1.00	0.24	1.83	2	137	1.27	4.142	1.33	5.5	1.69
Clear Ck (Kilchis)	0	31	1.00	0.25	1.89	168	112	1.62	6.904	1.55	4.5	1.56
Crooked Creek	0	70	1.00	0.19	1.65	242	283	1.39	4.542	1.36	5.0	1.63
East Fork Nehalem	1	88	1.09	0.28	1.97	0	148	1.15	3.954	1.32	2.5	1.31
Elk Creek (Nestucca)	0	45	1.00	0.18	1.62	19	285	1.25	4.542	1.36	6.0	1.75
Fall Creek	0	354	1.00	0.13	1.46	852	306	1.42	11.805	1.94	5.5	1.69
Gooseneck Creek	0	84	1.00	0.24	1.86	287	83	1.33	8.640	1.69	4.0	1.50
Kilchis Frontal	1	34	1.24	0.27	1.94	114	56	1.46	7.642	1.61	4.5	1.56
Lower Lobster	0	238	1.00	0.12	1.43	397	114	1.17	8.216	1.66	5.0	1.63
Lower So Fk Alsea	0	79	1.00	0.22	1.78	219	138	1.18	4.233	1.34	5.0	1.63
Mill Creek	0	148	1.00	0.21	1.72	901	336	1.33	4.282	1.34	5.5	1.69
Moon Creek	0	63	1.00	0.24	1.82	269	1,009	1.91	3.204	1.26	5.5	1.69
North Fork Alsea	0	145	1.00	0.18	1.63	232	413	1.20	4.499	1.36	5.0	1.63
North Fork Siletz	0	156	1.00	0.17	1.58	1,073	947	1.59	3.949	1.32	7.5	1.94
Pedee Creek	0	48	1.00	0.21	1.72	7	84	1.18	3.984	1.32	4.5	1.56
Quartzville Creek	50	451	1.89	0.13	1.44	6,674	2,546	1.98	4.505	1.36	5.0	1.63
Rowell-Gold Creek	0	142	1.00	0.19	1.66	361	63	1.24	8.537	1.68	5.5	1.69
Table Rock Fork	0	198	1.00	0.14	1.49	1,298	1,954	1.86	5.508	1.44	4.0	1.50
Testament Creek	0	42	1.00	0.17	1.61	28	224	1.36	6.063	1.49	5.5	1.69
Upper Lobster	0	60	1.00	0.14	1.48	563	362	1.47	4.209	1.34	5.5	1.69
Upper Molalla River	0	189	1.00	0.14	1.47	1,456	1,387	1.84	5.380	1.43	4.5	1.56
Upper Nestucca	0	256	1.00	0.17	1.60	94	404	1.18	9.890	1.79	5.5	1.69
Upper Rickreall Ck	0	46	1.00	0.17	1.60	191	265	1.64	4.339	1.35	6.0	1.75
Upper So Fk Alsea	0	122	1.00	0.20	1.70	88	69	1.04	3.958	1.32	4.5	1.56
Upper Willamina	0	368	1.00	0.22	1.78	37	538	1.21	9.249	1.74	4.5	1.56

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Flow Q 2 Yr. Flood (cfs/sq. mi.)	Fl Flow Rating	Landslide U Unstable Soils (Acres)	Li Land Slide Rating	WCI (B) Future Watershed Condition Index	WCI (PVT) Future Watershed Condition Index	WCI Current Watershed Condition Index
Alsea Frontal	67.6	1.35	33,318	1.75	46.1	39.4	41.3
Bear Creek (Salem)	96.5	1.51	3,882	1.90	64.6	41.6	45.6
Bible Creek	100.7	1.53	4,774	1.90	52.1	46.0	53.2
Clear Ck (Kilchis)	76.5	1.40	2,836	1.90	112.1	89.2	53.5
Crooked Creek	89.0	1.47	9,904	1.90	34.5	34.3	36.2
East Fork Nehalem	21.8	1.11	4,076	1.33	67.1	66.5	49.7
Elk Creek (Nestucca)	118.0	1.62	6,322	1.90	60.3	37.7	40.7
Fall Creek	104.0	1.55	19,192	1.90	68.2	56.4	60.4
Gooseneck Creek	69.3	1.36	6,208	1.90	78.1	75.1	75.6
Kilchis Frontal	76.5	1.40	2,478	1.80	254.4	172.5	45.5
Lower Lobster	86.8	1.46	18,534	1.90	49.0	38.1	41.8
Lower So Fk Alsea	88.3	1.46	10,928	1.84	59.1	40.3	38.1
Mill Creek	86.1	1.45	22,082	1.90	161.3	144.9	43.4
Moon Creek	105.7	1.55	12,606	1.90	80.3	69.2	59.2
North Fork Alsea	86.4	1.45	20,608	1.90	59.6	45.8	37.8
North Fork Siletz	179.9	1.94	25,318	1.90	135.8	124.4	80.2
Pedee Creek	82.4	1.43	6,630	1.79	120.6	112.2	106.5
Quartzville Creek	74.9	1.39	64,038	1.90	130.4	100.7	118.2
Rowell-Gold Creek	111.4	1.58	10,596	1.90	98.7	92.8	107.8
Table Rock Fork	58.5	1.31	22,672	1.89	72.7	57.0	34.7
Testament Creek	110.3	1.58	4,398	1.90	85.6	56.3	69.6
Upper Lobster	107.1	1.56	9,060	1.90	49.2	39.7	52.3
Upper Molalla River	71.7	1.38	22,482	1.90	113.3	101.9	88.2
Upper Nestucca	82.1	1.43	16,620	1.90	75.1	56.0	53.4
Upper Rickreall Ck	137.1	1.72	6,766	1.90	179.7	178.8	85.9
Upper So Fk Alsea	70.8	1.37	19,726	1.90	30.0	25.2	26.4
Upper Willamina	70.5	1.37	25,474	1.90	62.7	48.3	52.2

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

WCI Alternative C

			Soil Disturbance Factors					SDI	Vegetation Type Rating							VI
Watershed Name	Analytical Watershed Acres	Analytical Watershed Acres BLM	P Paved Roads (Acres)	R(+10) Rocked Roads (Acres)	D(+10) Dirt Roads (Acres)	S(+10) Skid Trails (Acres)	O Other Disturbances (Acres)	Soil Disturbance Rating	M Meadow (Grass) (Acres)	P Pasture/ Brush (Acres)	D Disturbed >20% Bare (Acres)	F(0-3) Forest 0-3 Yrs (Acres-All)	F(4-8) Forest 4-8 YRS (Acres-All)	F(0+10) Forest 10-20 YRS (Acres-All)	F(20+10) Forest >20 YRS (Acres)	Veg Type Rating
Alsea Frontal	41,309	14,206	46	1,591	387	1,312	76	1.43	316	1,445	5,750	1262	308	1739	28395	1.79
Bear Creek (Salem)	3,899	3,172	0	195	27	77	34	1.38	56	0	255	263	25	248	2781	1.58
Bible Creek	4,762	2,204	21	178	21	151	26	1.41	64	13	411	208	17	405	3390	1.61
Clear Ck (Kilchis)	2,834	1,341	0	120	5	91	14	1.41	28	0	170	367	285	199	1640	1.93
Crooked Creek	9,895	4,419	0	358	132	142	0	1.30	294	59	352	357	32	235	8121	1.36
East Fork Nehalem	14,244	4,353	0	709	80	970	11	1.73	159	0	1,785	1005	906	1058	8488	1.96
Elk Creek (Nestucca)	6,326	5,127	0	255	8	98	32	1.27	39	0	295	214	134	493	4843	1.42
Fall Creek	19,193	5,789	0	805	178	337	0	1.32	213	106	905	335	159	1118	15544	1.35
Gooseneck Creek	6,221	2,726	0	255	8	214	149	1.48	88	442	1,005	191	149	116	3820	1.96
Kilchis Frontal	2,814	854	0	96	6	166	13	1.60	0	85	127	443	242	149	1669	1.92
Lower Lobster	18,547	6,856	56	670	41	479	122	1.35	14	528	1,442	546	207	1050	13889	1.52
Lower So Fk Alsea	11,886	6,126	13	513	50	333	250	1.44	163	148	829	455	142	459	8877	1.51
Mill Creek	22,062	9,561	0	714	43	2,234	33	1.92	392	112	1,702	2426	2022	1372	13263	1.94
Moon Creek	12,593	5,392	0	368	21	386	130	1.37	129	129	874	869	514	1139	8441	1.69
North Fork Alsea	20,670	11,960	0	858	101	682	157	1.44	341	170	1,545	1515	695	1142	14186	1.70
North Fork Siletz	25,320	10,149	0	1,138	60	1,427	230	1.63	575	0	1,428	1880	1668	1772	16586	1.71
Pedee Creek	7,685	2,119	0	336	21	774	70	1.98	0	180	1,196	1057	857	271	3709	2.35
Quartzville Creek	64,041	21,228	313	1,567	59	1,610	1988	1.38	506	0	5,052	998	62	5798	47680	1.48
Rowell-Gold Creek	10,609	3,145	32	408	27	579	28	1.58	92	152	1,522	605	130	738	6896	1.89
Table Rock Fork	22,956	13,838	0	824	49	628	0	1.34	448	0	564	1595	1353	34	13986	1.48
Testament Creek	4,406	2,909	3	204	13	146	74	1.47	84	12	423	594	11	449	2520	1.94
Upper Lobster	9,063	8,077	0	345	33	236	0	1.34	247	0	480	1167	11	494	6310	1.72
Upper Molalla River	22,469	10,842	1	989	88	1,456	94	1.69	367	0	3,358	1762	1105	1958	12778	2.08
Upper Nestucca	16,596	11,235	67	723	62	636	11	1.47	78	0	1,688	1139	669	1263	10799	1.79
Upper Rickreall Ck	6,778	2,210	0	214	43	595	0	1.84	388	0	776	721	710	130	3843	2.17
Upper So Fk Alsea	19,742	12,576	68	933	208	500	0	1.41	301	0	1,052	1269	134	731	15420	1.50
Upper Willamina	25,486	11,231	53	990	86	820	0	1.40	192	178	2,412	1198	254	1554	18750	1.64

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

	Silvicultural Practices					Si	RIPARIAN RATING					Ri
Watershed Name	T(+10) Tractor Piling (Acres)	B(+10) Burning Recent (Acres)	H Herbicides (Last Year) (Acres)	F Fertilization (10Yr/10) (Acres)	P PCT (5 Yrs) (Acres)	Silvic. Practices Rating	S(+10) Seedlings/ Saplings (Acres + I/O)	P(+10) Pole Timber (Acres + I/O)	T(+10) Small Saw Timber (Acres + I/O)	L(+10) Large Saw Timber (Acres + I/O)	R Total Riparian (Acres)	Riparian Rating
Alsea Frontal	249	192	250	15	600	1.09	215	898	2294	741	3981	1.43
Bear Creek (Salem)	0	36	0	40	75	1.06	10	26	128	119	273	1.33
Bible Creek	104	32	0	0	22	1.19	10	30	85	234	349	1.26
Clear Ck (Kilchis)	18	61	0	0	0	1.13	75	14	202	0	285	1.56
Crooked Creek	74	27	50	0	100	1.09	17	195	623	211	1033	1.39
East Fork Nehalem	664	160	4,100	498	0	2.09	194	192	434	235	999	1.51
Elk Creek (Nestucca)	16	32	0	11	87	1.05	26	108	286	192	600	1.37
Fall Creek	254	39	300	20	500	1.16	63	120	807	267	1217	1.39
Gooseneck Creek	101	33	0	151	0	1.18	9	31	258	53	348	1.38
Kilchis Frontal	187	58	70	0	0	1.63	298	401	88	85	616	1.96
Lower Lobster	109	78	0	0	200	1.07	205	736	1069	595	2434	1.47
Lower So Fk Alsea	227	66	0	0	200	1.18	95	243	772	266	1321	1.43
Mill Creek	2829	170	0	2	0	1.99	274	130	1149	330	1850	1.45
Moon Creek	93	163	20	0	104	1.11	102	51	115	472	720	1.33
North Fork Alsea	385	183	150	20	400	1.21	296	359	726	885	2137	1.42
North Fork Siletz	893	280	0	430	40	1.33	270	248	1301	405	2194	1.44
Pedee Creek	399	211	0	4	300	1.52	150	103	441	0	683	1.56
Quartzville Creek	651	182	0	0	480	1.09	266	1235	1782	421	3440	1.51
Rowell-Gold Creek	583	95	0	3	10	1.45	20	33	421	94	556	1.38
Table Rock Fork	473	284	0	74	133	1.21	423	551	790	30	1635	1.65
Testament Creek	56	115	0	0	36	1.20	17	46	202	63	311	1.42
Upper Lobster	158	206	0	0	200	1.23	26	207	374	67	648	1.47
Upper Molalla River	604	281	0	0	0	1.25	311	630	813	205	1817	1.57
Upper Nestucca	73	196	120	54	273	1.11	118	167	782	917	1923	1.33
Upper Rickreall Ck	278	126	400	0	30	1.51	124	72	385	118	692	1.47
Upper So Fk Alsea	180	193	100	0	400	1.13	54	154	1065	630	1863	1.34
Upper Willamina	367	190	0	0	200	1.14	98	227	1553	907	2726	1.34

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Mining Rating N Notices (#)	M Stream (Miles)	MI Mining Rating	Soils S1*K1/W Ave K* Factor	KI Soils Rating	Slope/Aspect S Slopes >60% (Acres)	Slope/Aspect A Critical Aspects (Acres)	AI Slope/Aspect Rating	Drainage DD Drainage Density (Mi/Sq Mi)	DI Drainage Density Rating	Precip P Ave Storm 2Yr-24Hr. (inches)	PI Precip Rating
Alsea Frontal	0	340	1.00	0.22	1.76	563	236	1.13	5.270	1.42	4.5	1.56
Bear Creek (Salem)	0	28	1.00	0.21	1.72	0	293	1.40	4.603	1.37	5.5	1.69
Bible Creek	0	31	1.00	0.24	1.83	2	137	1.27	4.142	1.33	5.5	1.69
Clear Ck (Kilchis)	0	31	1.00	0.25	1.89	168	112	1.62	6.904	1.55	4.5	1.56
Crooked Creek	0	70	1.00	0.19	1.65	242	283	1.39	4.542	1.36	5.0	1.63
East Fork Nehalem	1	88	1.09	0.28	1.97	0	148	1.15	3.954	1.32	2.5	1.31
Elk Creek (Nestucca)	0	45	1.00	0.18	1.62	19	285	1.25	4.542	1.36	6.0	1.75
Fall Creek	0	354	1.00	0.13	1.46	852	306	1.42	11.805	1.94	5.5	1.69
Gooseneck Creek	0	84	1.00	0.24	1.86	287	83	1.33	8.640	1.69	4.0	1.50
Kilchis Frontal	1	34	1.24	0.27	1.94	114	56	1.46	7.642	1.61	4.5	1.56
Lower Lobster	0	238	1.00	0.12	1.43	397	114	1.17	8.216	1.66	5.0	1.63
Lower So Fk Alsea	0	79	1.00	0.22	1.78	219	138	1.18	4.233	1.34	5.0	1.63
Mill Creek	0	148	1.00	0.21	1.72	901	336	1.33	4.282	1.34	5.5	1.69
Moon Creek	0	63	1.00	0.24	1.82	269	1,009	1.91	3.204	1.26	5.5	1.69
North Fork Alsea	0	145	1.00	0.18	1.63	232	413	1.20	4.499	1.36	5.0	1.63
North Fork Siletz	0	156	1.00	0.17	1.58	1,073	947	1.59	3.949	1.32	7.5	1.94
Pedee Creek	0	48	1.00	0.21	1.72	7	84	1.18	3.984	1.32	4.5	1.56
Quartzville Creek	50	451	1.89	0.13	1.44	6,674	2,546	1.98	4.505	1.36	5.0	1.63
Rowell-Gold Creek	0	142	1.00	0.19	1.66	361	63	1.24	8.537	1.68	5.5	1.69
Table Rock Fork	0	198	1.00	0.14	1.49	1,298	1,954	1.86	5.508	1.44	4.0	1.50
Testament Creek	0	42	1.00	0.17	1.61	28	224	1.36	6.063	1.49	5.5	1.69
Upper Lobster	0	60	1.00	0.14	1.48	563	362	1.47	4.209	1.34	5.5	1.69
Upper Molalla River	0	189	1.00	0.14	1.47	1,456	1,387	1.84	5.380	1.43	4.5	1.56
Upper Nestucca	0	256	1.00	0.17	1.60	94	404	1.18	9.890	1.79	5.5	1.69
Upper Rickreall Ck	0	46	1.00	0.17	1.60	191	265	1.64	4.339	1.35	6.0	1.75
Upper So Fk Alsea	0	122	1.00	0.20	1.70	88	69	1.04	3.958	1.32	4.5	1.56
Upper Willamina	0	368	1.00	0.22	1.78	37	538	1.21	9.249	1.74	4.5	1.56

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Flow Q 2 Yr. Flood (cfs/sq. mi.)	FI Flow Rating	Landslide U Unstable Soils (Acres)	LI Land Slide Rating	WCI (C) Future Watershed Condition Index	WCI (PVT) Future Watershed Condition Index	WCI Current Watershed Condition Index
Alsea Frontal	67.6	1.35	33,318	1.75	41.9	39.4	41.3
Bear Creek (Salem)	96.5	1.51	3,882	1.90	48.8	41.6	45.6
Bible Creek	100.7	1.53	4,774	1.90	51.8	46.0	53.2
Clear Ck (Kilchis)	76.5	1.40	2,836	1.90	94.8	89.2	53.5
Crooked Creek	89.0	1.47	9,904	1.90	37.7	34.3	36.2
East Fork Nehalem	21.8	1.11	4,076	1.33	67.3	66.5	49.7
Elk Creek (Nestucca)	118.0	1.62	6,322	1.90	38.9	37.7	40.7
Fall Creek	104.0	1.55	19,192	1.90	57.8	56.4	60.4
Gooseneck Creek	69.3	1.36	6,208	1.90	76.3	75.1	75.6
Kilchis Frontal	76.5	1.40	2,478	1.80	219.4	172.5	45.5
Lower Lobster	86.8	1.46	18,534	1.90	40.1	38.1	41.8
Lower So Fk Alsea	88.3	1.46	10,928	1.84	44.9	40.3	38.1
Mill Creek	86.1	1.45	22,082	1.90	154.5	144.9	43.4
Moon Creek	105.7	1.55	12,606	1.90	75.0	69.2	59.2
North Fork Alsea	86.4	1.45	20,608	1.90	50.1	45.8	37.8
North Fork Siletz	179.9	1.94	25,318	1.90	126.3	124.4	80.2
Pedee Creek	82.4	1.43	6,630	1.79	118.3	112.2	106.5
Quartzville Creek	74.9	1.39	64,038	1.90	105.3	100.7	118.2
Rowell-Gold Creek	111.4	1.58	10,596	1.90	104.5	92.8	107.8
Table Rock Fork	58.5	1.31	22,672	1.89	58.5	57.0	34.7
Testament Creek	110.3	1.58	4,398	1.90	79.9	56.3	69.6
Upper Lobster	107.1	1.56	9,060	1.90	60.7	39.7	52.3
Upper Molalla River	71.7	1.38	22,482	1.90	108.7	101.9	88.2
Upper Nestucca	82.1	1.43	16,620	1.90	60.0	56.0	53.4
Upper Rickreall Ck	137.1	1.72	6,766	1.90	180.1	178.8	85.9
Upper So Fk Alsea	70.8	1.37	19,726	1.90	30.4	25.2	26.4
Upper Willamina	70.5	1.37	25,474	1.90	53.6	48.3	52.2

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

WCI Alternative D

			Soil Disturbance Factors					SDI		Vegetation Type Rating						VI
Watershed Name	Analytical Watershed Acres	Analytical Watershed Acres BLM	P Paved Roads (Acres)	R(+10) Rocked Roads (Acres)	D(+10) Dirt Roads (Acres)	S(+10) Skid Trails (Acres)	O Other Disturbances (Acres)	Soil Disturbance Rating	M Meadow (Grass) (Acres)	P Pasture/ Brush (Acres)	D Disturbed >20% Bare (Acres)	F(0-3) Forest 0-3 Yrs (Acres-All)	F(4-8) Forest 4-8 YRS (Acres-All)	F(0+10) Forest 10-20 YRS (Acres-All)	F(20+10) Forest >20 YRS (Acres)	Veg Type Rating
Alsea Frontal	41,309	14,206	46	1,577	387	1,315	76	1.43	316	1,445	5,750	1164	308	1739	28493	1.78
Bear Creek (Salem)	3,899	3,172	0	194	27	71	34	1.36	56	0	255	25	25	248	3018	1.40
Bible Creek	4,762	2,204	21	176	20	145	26	1.40	64	13	411	26	17	405	3572	1.49
Clear Ck (Kilchis)	2,834	1,341	0	120	5	93	14	1.42	28	0	170	471	285	199	1536	2.04
Crooked Creek	9,895	4,419	0	350	132	143	0	1.30	294	59	352	253	32	235	8226	1.33
East Fork Nehalem	14,244	4,353	0	710	80	989	11	1.74	159	0	1,785	1567	906	1058	7926	2.07
Elk Creek (Nestucca)	6,326	5,127	0	254	8	97	32	1.27	39	0	295	134	134	493	4922	1.38
Fall Creek	19,193	5,789	0	803	178	332	0	1.32	213	106	905	180	159	1118	15699	1.33
Gooseneck Creek	6,221	2,726	0	254	8	213	149	1.48	88	442	1,005	149	149	116	3862	1.94
Kilchis Frontal	2,814	854	0	94	6	163	13	1.59	0	85	127	378	242	149	1735	1.85
Lower Lobster	18,547	6,856	56	661	41	470	122	1.35	14	528	1,442	266	207	1050	14169	1.48
Lower So Fk Alsea	11,886	6,126	13	515	50	333	250	1.44	163	148	829	867	142	459	8466	1.61
Mill Creek	22,062	9,561	0	707	42	2,220	33	1.92	392	112	1,702	2022	2022	1372	13667	1.89
Moon Creek	12,593	5,392	0	365	21	373	130	1.37	129	129	874	514	514	1139	8795	1.61
North Fork Alsea	20,670	11,960	0	830	101	663	157	1.43	341	170	1,545	695	695	1142	15005	1.58
North Fork Siletz	25,320	10,149	0	1,131	60	1,430	230	1.63	575	0	1,428	1734	1668	1772	16732	1.69
Pedee Creek	7,685	2,119	0	336	21	766	70	1.97	0	180	1,196	857	857	271	3909	2.27
Quartzville Creek	64,041	21,228	313	1,562	59	1,584	1988	1.37	506	0	5,052	342	62	5798	48336	1.45
Rowell-Gold Creek	10,609	3,145	32	397	27	567	28	1.57	92	152	1,522	159	130	738	7342	1.77
Table Rock Fork	22,956	13,838	0	823	49	638	0	1.34	448	0	564	1701	1353	34	13880	1.50
Testament Creek	4,406	2,909	3	202	13	122	74	1.43	84	12	423	11	11	449	3102	1.55
Upper Lobster	9,063	8,077	0	336	33	180	0	1.29	247	0	480	16	11	494	7461	1.34
Upper Molalla River	22,469	10,842	1	983	88	1,438	94	1.68	367	0	3,358	1105	1105	1958	13434	1.99
Upper Nestucca	16,596	11,235	67	720	61	625	11	1.46	78	0	1,688	724	669	1263	11214	1.72
Upper Rickreall Ck	6,778	2,210	0	217	43	598	0	1.84	388	0	776	822	710	130	3742	2.22
Upper So Fk Alsea	19,742	12,576	68	930	208	478	0	1.40	301	0	1,052	1032	134	731	15657	1.46
Upper Willamina	25,486	11,231	53	987	86	807	0	1.39	192	178	2,412	738	254	1554	19210	1.58

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

	Silvicultural Practices					SI	RIPARIAN RATING					RI
Watershed Name	T(+10) Tractor Piling (Acres)	B(+10) Burning Recent (Acres)	H Herbicides (Last Year) (Acres)	F Fertilization (10Yr/10) (Acres)	P PCT (5 Yrs) (Acres)	Silvic. Practices Rating	S(+10) Seedlings/ Saplings (Acres + I/O)	P(+10) Pole Timber (Acres + I/O)	T(+10) Small Saw Timber (Acres + I/O)	L(+10) Large Saw Timber (Acres + I/O)	R Total Riparian (Acres)	Riparian Rating
Alsea Frontal	254	226	250	15	600	1.09	224	898	2294	741	3981	1.44
Bear Creek (Salem)	0	5	0	40	75	1.03	13	26	128	119	273	1.34
Bible Creek	93	5	0	0	22	1.15	13	30	85	234	349	1.26
Clear Ck (Kilchis)	21	93	0	0	0	1.18	78	14	202	0	285	1.57
Crooked Creek	82	46	50	0	100	1.10	17	195	623	211	1033	1.39
East Fork Nehalem	741	277	4,100	498	0	2.16	194	192	434	235	999	1.51
Elk Creek (Nestucca)	16	27	0	11	87	1.05	34	108	286	192	600	1.39
Fall Creek	252	33	300	20	500	1.16	67	120	807	267	1217	1.39
Gooseneck Creek	99	28	0	151	0	1.17	9	31	258	53	348	1.38
Kilchis Frontal	178	54	70	0	0	1.60	298	401	88	85	616	1.96
Lower Lobster	104	51	0	0	200	1.06	213	736	1069	595	2434	1.47
Lower So Fk Alsea	307	143	0	0	200	1.25	116	243	772	266	1321	1.45
Mill Creek	2654	149	0	2	0	1.93	288	130	1149	330	1850	1.45
Moon Creek	81	99	20	0	104	1.09	112	51	115	472	720	1.34
North Fork Alsea	374	133	150	20	400	1.19	304	359	726	885	2137	1.43
North Fork Siletz	904	291	0	430	40	1.34	274	248	1301	405	2194	1.44
Pedee Creek	399	171	0	4	300	1.50	152	103	441	0	683	1.56
Quartzville Creek	635	67	0	0	480	1.08	297	1235	1782	421	3440	1.52
Rowell-Gold Creek	547	29	0	3	10	1.40	24	33	421	94	556	1.38
Table Rock Fork	479	331	0	74	133	1.22	423	551	790	30	1635	1.65
Testament Creek	48	2	0	0	36	1.09	22	46	202	63	311	1.43
Upper Lobster	67	3	0	0	200	1.07	37	207	374	67	648	1.49
Upper Molalla River	580	207	0	0	0	1.23	311	630	813	205	1817	1.57
Upper Nestucca	69	143	120	54	273	1.10	144	167	782	917	1923	1.34
Upper Rickreall Ck	290	146	400	0	30	1.54	124	72	385	118	692	1.47
Upper So Fk Alsea	180	196	100	0	400	1.13	71	154	1065	630	1863	1.35
Upper Willamina	352	139	0	0	200	1.13	116	227	1553	907	2726	1.35

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Mining Rating N Notices (#)	M Stream (Miles)	MI Mining Rating	Soils S1*K1/W Ave K* Factor	KI Soils Rating	Slope/Aspect S Slopes >60% (Acres)	A Critical Aspects (Acres)	AI Slope/ Aspect Rating	Drainage DD Drainage Density (Mi/Sq MI)	DI Drainage Density Rating	Precip P Ave Storm 2Yr-24Hr. (Inches)	PI Precip Rating
Alsea Frontal	0	340	1.00	0.22	1.76	563	236	1.13	5.270	1.42	4.5	1.56
Bear Creek (Salem)	0	28	1.00	0.21	1.72	0	293	1.40	4.603	1.37	5.5	1.69
Bible Creek	0	31	1.00	0.24	1.83	2	137	1.27	4.142	1.33	5.5	1.69
Clear Ck (Kilchis)	0	31	1.00	0.25	1.89	168	112	1.62	6.904	1.55	4.5	1.56
Crooked Creek	0	70	1.00	0.19	1.65	242	283	1.39	4.542	1.36	5.0	1.63
East Fork Nehalem	1	88	1.09	0.28	1.97	0	148	1.15	3.954	1.32	2.5	1.31
Elk Creek (Nestucca)	0	45	1.00	0.18	1.62	19	285	1.25	4.542	1.36	6.0	1.75
Fall Creek	0	354	1.00	0.13	1.46	852	306	1.42	11.805	1.94	5.5	1.69
Gooseneck Creek	0	84	1.00	0.24	1.86	287	83	1.33	8.640	1.69	4.0	1.50
Kilchis Frontal	1	34	1.24	0.27	1.94	114	56	1.46	7.642	1.61	4.5	1.56
Lower Lobster	0	238	1.00	0.12	1.43	397	114	1.17	8.216	1.66	5.0	1.63
Lower So Fk Alsea	0	79	1.00	0.22	1.78	219	138	1.18	4.233	1.34	5.0	1.63
Mill Creek	0	148	1.00	0.21	1.72	901	336	1.33	4.282	1.34	5.5	1.69
Moon Creek	0	63	1.00	0.24	1.82	269	1,009	1.91	3.204	1.26	5.5	1.69
North Fork Alsea	0	145	1.00	0.18	1.63	232	413	1.20	4.499	1.36	5.0	1.63
North Fork Siletz	0	156	1.00	0.17	1.58	1,073	947	1.59	3.949	1.32	7.5	1.94
Pedee Creek	0	48	1.00	0.21	1.72	7	84	1.18	3.984	1.32	4.5	1.56
Quartzville Creek	50	451	1.89	0.13	1.44	6,674	2,546	1.98	4.505	1.36	5.0	1.63
Rowell-Gold Creek	0	142	1.00	0.19	1.66	361	63	1.24	8.537	1.68	5.5	1.69
Table Rock Fork	0	198	1.00	0.14	1.49	1,298	1,954	1.86	5.508	1.44	4.0	1.50
Testament Creek	0	42	1.00	0.17	1.61	28	224	1.36	6.063	1.49	5.5	1.69
Upper Lobster	0	60	1.00	0.14	1.48	563	362	1.47	4.209	1.34	5.5	1.69
Upper Molalla River	0	189	1.00	0.14	1.47	1,456	1,387	1.84	5.380	1.43	4.5	1.56
Upper Nestucca	0	256	1.00	0.17	1.60	94	404	1.18	9.890	1.79	5.5	1.69
Upper Rickreall Ck	0	46	1.00	0.17	1.60	191	265	1.64	4.339	1.35	6.0	1.75
Upper So Fk Alsea	0	122	1.00	0.20	1.70	88	69	1.04	3.958	1.32	4.5	1.56
Upper Willamina	0	368	1.00	0.22	1.78	37	538	1.21	9.249	1.74	4.5	1.56

WCI Alternative D

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Flow Q 2 Yr. Flood (cfs/sq. mi.)	FI Flow Rating	Landslide U Unstable Soils (Acres)	LI Land Slide Rating	WCI (D) Future Watershed Condition Index	WCI (PVT) Future Watershed Condition Index	WCI Current Watershed Condition Index
Alsea Frontal	67.6	1.35	33,318	1.75	41.9	39.4	41.3
Bear Creek (Salem)	96.5	1.51	3,882	1.90	41.9	41.6	45.6
Bible Creek	100.7	1.53	4,774	1.90	46.5	46.0	53.2
Clear Ck (Kilchis)	76.5	1.40	2,836	1.90	105.6	89.2	53.5
Crooked Creek	89.0	1.47	9,904	1.90	37.3	34.3	36.2
East Fork Nehalem	21.8	1.11	4,076	1.33	74.2	66.5	49.7
Elk Creek (Nestucca)	118.0	1.62	6,322	1.90	38.0	37.7	40.7
Fall Creek	104.0	1.55	19,192	1.90	56.8	56.4	60.4
Gooseneck Creek	69.3	1.36	6,208	1.90	75.1	75.1	75.6
Kilchis Frontal	76.5	1.40	2,478	1.80	206.5	172.5	45.5
Lower Lobster	86.8	1.46	18,534	1.90	38.6	38.1	41.8
Lower So Fk Alsea	88.3	1.46	10,928	1.84	51.6	40.3	38.1
Mill Creek	86.1	1.45	22,082	1.90	145.7	144.9	43.3
Moon Creek	105.7	1.55	12,606	1.90	69.9	69.2	59.2
North Fork Alsea	86.4	1.45	20,608	1.90	45.9	45.8	37.8
North Fork Siletz	179.9	1.94	25,318	1.90	125.7	124.4	80.2
Pedee Creek	82.4	1.43	6,630	1.79	112.7	112.2	106.5
Quartzville Creek	74.9	1.39	64,038	1.90	102.7	100.7	118.2
Rowell-Gold Creek	111.4	1.58	10,596	1.90	94.1	92.8	107.8
Table Rock Fork	58.5	1.31	22,672	1.89	59.7	57.0	34.7
Testament Creek	110.3	1.58	4,398	1.90	56.9	56.3	69.6
Upper Lobster	107.1	1.56	9,060	1.90	40.3	39.7	52.3
Upper Molalla River	71.7	1.38	22,482	1.90	102.1	101.9	88.2
Upper Nestucca	82.1	1.43	16,620	1.90	57.2	56.0	53.4
Upper Rickreall Ck	137.1	1.72	6,766	1.90	187.3	178.8	85.9
Upper So Fk Alsea	70.8	1.37	19,726	1.90	29.7	25.2	26.4
Upper Willamina	70.5	1.37	25,474	1.90	51.4	48.3	52.2

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

WCI Alternative E

			Soil Disturbance Factors					SDI	Vegetation Type Rating							VI
Watershed Name	Analytical Watershed Acres	Analytical Watershed Acres BLM	P Paved Roads (Acres)	R(+10) Rocked Roads (Acres)	D(+10) Dirt Roads (Acres)	S(+10) Skid Trails (Acres)	O Other Disturbances (Acres)	Soil Disturbance Rating	M Meadow (Grass) (Acres)	P Pasture/ Brush (Acres)	D Disturbed >20% Bare (Acres)	F(0-3) Forest 0-3 Yrs (Acres-All)	F(4-8) Forest 4-8 YRS (Acres-All)	F(0+10) Forest 10-20 YRS (Acres-All)	F(20+10) Forest >20 YRS (Acres)	Veg Type Rating
Alsea Frontal	41,309	14,206	46	1,575	387	1,304	76	1.43	316	1,445	5,750	1112	308	1739	28545	1.78
Bear Creek (Salem)	3,899	3,172	0	194	27	89	34	1.40	56	0	255	553	25	248	2490	1.80
Bible Creek	4,762	2,204	21	178	20	151	26	1.41	64	13	411	217	17	405	3381	1.61
Clear Ck (Kilchis)	2,834	1,341	0	120	5	94	14	1.42	28	0	170	400	285	199	1607	1.96
Crooked Creek	9,895	4,419	0	348	132	132	0	1.29	294	59	352	32	32	235	8447	1.27
East Fork Nehalem	14,244	4,353	0	706	80	971	11	1.73	159	0	1,785	947	906	1058	8546	1.95
Elk Creek (Nestucca)	6,326	5,127	0	256	8	122	32	1.30	39	0	295	844	134	493	4212	1.71
Fall Creek	19,193	5,789	0	807	178	373	0	1.34	213	106	905	948	159	1118	14931	1.44
Gooseneck Creek	6,221	2,726	0	254	8	213	149	1.48	88	442	1,005	158	149	116	3853	1.94
Kilchis Frontal	2,814	854	0	95	6	166	13	1.60	0	85	127	453	242	149	1660	1.93
Lower Lobster	18,547	6,856	56	679	41	534	122	1.38	14	528	1,442	1459	207	1050	12976	1.67
Lower So Fk Alsea	11,886	6,126	13	513	50	313	250	1.43	163	148	829	531	142	459	8802	1.53
Mill Creek	22,062	9,561	0	707	42	2,222	33	1.92	392	112	1,702	2062	2022	1372	13627	1.89
Moon Creek	12,593	5,392	0	366	21	388	130	1.37	129	129	874	1031	514	1139	8278	1.73
North Fork Alsea	20,670	11,960	0	842	101	727	157	1.46	341	170	1,545	1964	695	1142	13736	1.76
North Fork Siletz	25,320	10,149	0	1,131	60	1,427	230	1.63	575	0	1,428	1668	1668	1772	16798	1.68
Pedee Creek	7,685	2,119	0	336	21	766	70	1.97	0	180	1,196	865	857	271	3901	2.28
Quartzville Creek	64,041	21,228	313	1,560	59	1,574	1988	1.37	506	0	5,052	68	62	5798	48610	1.43
Rowell-Gold Creek	10,609	3,145	32	397	27	567	28	1.57	92	152	1,522	143	130	738	7358	1.77
Table Rock Fork	22,956	13,838	0	825	49	642	0	1.34	448	0	564	1873	1353	34	13708	1.52
Testament Creek	4,406	2,909	3	202	13	143	74	1.47	84	12	423	651	11	449	2462	1.98
Upper Lobster	9,063	8,077	0	336	33	183	0	1.29	247	0	480	55	11	494	7422	1.36
Upper Molalla River	22,469	10,842	1	985	88	1,461	94	1.69	367	0	3,358	1539	1105	1958	13000	2.05
Upper Nestucca	16,596	11,235	67	722	61	661	11	1.48	78	0	1,688	1763	669	1263	10175	1.90
Upper Rickreall Ck	6,778	2,210	0	214	43	595	0	1.84	388	0	776	710	710	130	3854	2.17
Upper So Fk Alsea	19,742	12,576	68	924	208	444	0	1.39	301	0	1,052	342	134	731	16347	1.36
Upper Willamina	25,486	11,231	53	992	86	848	0	1.41	192	178	2,412	1978	254	1554	17970	1.73

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Silvicultural Practices: T(+10) Tractor Piling (Acres)	B(+10) Burning Recent (Acres)	H Herbicides (Last Year) (Acres)	F Fertilization (10Yr/10) (Acres)	P PCT (5 Yrs) (Acres)	SI Silvic. Practices Rating	RIPARIAN RATING: S(+10) Seedlings/ Saplings (Acres + I/O)	P(+10) Pole Timber (Acres + I/O)	T(+10) Small Saw Timber (Acres + I/O)	L(+10) Large Saw Timber (Acres + I/O)	R Total Riparian (Acres)	RI Riparian Rating
Alsea Frontal	252	216	250	15	600	1.09	215	898	2294	741	3981	1.43
Bear Creek (Salem)	0	111	0	40	75	1.14	10	26	128	119	273	1.33
Bible Creek	107	40	0	0	22	1.20	10	30	85	234	349	1.26
Clear Ck (Kilchis)	20	79	0	0	0	1.16	75	14	202	0	285	1.56
Crooked Creek	64	6	50	0	100	1.07	17	195	623	211	1033	1.39
East Fork Nehalem	669	167	4,100	498	0	2.10	194	192	434	235	999	1.51
Elk Creek (Nestucca)	23	167	0	11	87	1.14	26	108	286	192	600	1.37
Fall Creek	308	176	300	20	500	1.21	63	120	807	267	1217	1.39
Gooseneck Creek	99	29	0	151	0	1.17	9	31	258	53	348	1.38
Kilchis Frontal	199	65	70	0	0	1.67	298	401	88	85	616	1.96
Lower Lobster	150	281	0	0	200	1.13	205	736	1069	595	2434	1.47
Lower So Fk Alsea	249	88	0	0	200	1.20	95	243	772	266	1321	1.43
Mill Creek	2679	152	0	2	0	1.94	274	130	1149	330	1850	1.45
Moon Creek	100	199	20	0	104	1.13	102	51	115	472	720	1.33
North Fork Alsea	430	375	150	20	400	1.26	296	359	726	885	2137	1.42
North Fork Siletz	893	280	0	430	40	1.33	270	248	1301	405	2194	1.44
Pedee Creek	399	173	0	4	300	1.50	150	103	441	0	683	1.56
Quartzville Creek	628	13	0	0	480	1.08	266	1235	1782	421	3440	1.51
Rowell-Gold Creek	545	26	0	3	10	1.40	20	33	421	94	556	1.38
Table Rock Fork	484	365	0	74	133	1.23	423	551	790	30	1635	1.65
Testament Creek	57	128	0	0	36	1.21	17	46	202	63	311	1.42
Upper Lobster	70	10	0	0	200	1.08	26	207	374	67	648	1.47
Upper Molalla River	607	289	0	0	0	1.25	311	630	813	205	1817	1.57
Upper Nestucca	82	348	120	54	273	1.15	118	167	782	917	1923	1.33
Upper Rickreall Ck	278	126	400	0	30	1.51	124	72	385	118	692	1.47
Upper So Fk Alsea	146	65	100	0	400	1.09	54	154	1065	630	1863	1.34
Upper Willamina	422	373	0	0	200	1.18	98	227	1553	907	2726	1.34

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Mining Rating N Notices (#)	M Stream (Miles)	MI Mining Rating	Soils S1*K1/W Ave K* Factor	KI Soils Rating	Slope/Aspect S Slopes >60% (Acres)	A Critical Aspects (Acres)	AI Slope/ Aspect Rating	Drainage DD Drainage Density (Mi/Sq Mi)	DI Drainage Density Rating	Precip P Ave Storm 2Yr-24Hr. (Inches)	PI Precip Rating
Alsea Frontal	0	340	1.00	0.22	1.76	563	236	1.13	5.270	1.42	4.5	1.56
Bear Creek (Salem)	0	28	1.00	0.21	1.72	0	293	1.40	4.603	1.37	5.5	1.69
Bible Creek	0	31	1.00	0.24	1.83	2	137	1.27	4.142	1.33	5.5	1.69
Clear Ck (Kilchis)	0	31	1.00	0.25	1.89	168	112	1.62	6.904	1.55	4.5	1.56
Crooked Creek	0	70	1.00	0.19	1.65	242	283	1.39	4.542	1.36	5.0	1.63
East Fork Nehalem	1	88	1.09	0.28	1.97	0	148	1.15	3.954	1.32	2.5	1.31
Elk Creek (Nestucca)	0	45	1.00	0.18	1.62	19	285	1.25	4.542	1.36	6.0	1.75
Fall Creek	0	354	1.00	0.13	1.46	852	306	1.42	11.805	1.94	5.5	1.69
Gooseneck Creek	0	84	1.00	0.24	1.86	287	83	1.33	8.640	1.69	4.0	1.50
Kilchis Frontal	1	34	1.24	0.27	1.94	114	56	1.46	7.642	1.61	4.5	1.56
Lower Lobster	0	238	1.00	0.12	1.43	397	114	1.17	8.216	1.66	5.0	1.63
Lower So Fk Alsea	0	79	1.00	0.22	1.78	219	138	1.18	4.233	1.34	5.0	1.63
Mill Creek	0	148	1.00	0.21	1.72	901	336	1.33	4.282	1.34	5.5	1.69
Moon Creek	0	63	1.00	0.24	1.82	269	1,009	1.91	3.204	1.26	5.5	1.69
North Fork Alsea	0	145	1.00	0.18	1.63	232	413	1.20	4.499	1.36	5.0	1.63
North Fork Siletz	0	156	1.00	0.17	1.58	1,073	947	1.59	3.949	1.32	7.5	1.94
Pedee Creek	0	48	1.00	0.21	1.72	7	84	1.18	3.984	1.32	4.5	1.56
Quartzville Creek	50	451	1.89	0.13	1.44	6,674	2,546	1.98	4.505	1.36	5.0	1.63
Rowell-Gold Creek	0	142	1.00	0.19	1.66	361	63	1.24	8.537	1.68	5.5	1.69
Table Rock Fork	0	198	1.00	0.14	1.49	1,298	1,954	1.86	5.508	1.44	4.0	1.50
Testament Creek	0	42	1.00	0.17	1.61	28	224	1.36	6.063	1.49	5.5	1.69
Upper Lobster	0	60	1.00	0.14	1.48	563	362	1.47	4.209	1.34	5.5	1.69
Upper Molalla River	0	189	1.00	0.14	1.47	1,456	1,387	1.84	5.380	1.43	4.5	1.56
Upper Nestucca	0	256	1.00	0.17	1.60	94	404	1.18	9.890	1.79	5.5	1.69
Upper Rickreall Ck	0	46	1.00	0.17	1.60	191	265	1.64	4.339	1.35	6.0	1.75
Upper So Fk Alsea	0	122	1.00	0.20	1.70	88	69	1.04	3.958	1.32	4.5	1.56
Upper Willamina	0	368	1.00	0.22	1.78	37	538	1.21	9.249	1.74	4.5	1.56

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Flow Q 2 Yr. Flood (cfs/sq. mi.)	FI Flow Rating	Landslide U Unstable Soils (Acres)	LI Land Slide Rating	WCI (E) Future Watershed Condition Index	WCI (PVT) Future Watershed Condition Index	WCI Current Watershed Condition Index
Alsea Frontal	67.6	1.35	33,318	1.75	41.7	39.4	41.3
Bear Creek (Salem)	96.5	1.51	3,882	1.90	60.3	41.6	45.6
Bible Creek	100.7	1.53	4,774	1.90	52.6	46.0	53.2
Clear Ck (Kilchis)	76.5	1.40	2,836	1.90	99.4	89.2	53.5
Crooked Creek	89.0	1.47	9,904	1.90	34.3	34.3	36.2
East Fork Nehalem	21.8	1.11	4,076	1.33	67.1	66.5	49.7
Elk Creek (Nestucca)	118.0	1.62	6,322	1.90	52.0	37.7	40.7
Fall Creek	104.0	1.55	19,192	1.90	65.2	56.4	60.4
Gooseneck Creek	69.3	1.36	6,208	1.90	75.4	75.1	75.6
Kilchis Frontal	76.5	1.40	2,478	1.80	226.2	172.5	45.5

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

WCI Alternative PA

			Soil Disturbance Factors					SDI	Vegetation Type Rating							VI
Watershed Name	Analytical Watershed Acres	Analytical Watershed Acres BLM	P Paved Roads (Acres)	R(+10) Rocked Roads (Acres)	D(+10) Dirt Roads (Acres)	S(+10) Skid Trails (Acres)	O Other Disturbances (Acres)	Soil Disturbance Rating	M Meadow (Grass) (Acres)	P Pasture/ Brush (Acres)	D Disturbed >20% Bare (Acres)	F(0-3) Forest 0-3 Yrs (Acres-All)	F(4-8) Forest 4-8 YRS (Acres-All)	F(0+10) Forest 10-20 YRS (Acres-All)	F(20+10) Forest >20 YRS (Acres)	Veg Type Rating
Alsea Frontal	41,309	14,206	46	1,588	387	1,325	76	1.43	316	1,445	5,750	1407	308	1739	28251	1.80
Bear Creek (Salem)	3,899	3,172	0	194	27	76	34	1.37	56	0	255	197	25	248	2846	1.53
Bible Creek	4,762	2,204	21	180	21	151	26	1.41	64	13	411	225	17	405	3373	1.62
Clear Ck (Kilchis)	2,834	1,341	0	120	4	90	14	1.41	28	0	170	288	285	199	1720	1.85
Crooked Creek	9,895	4,419	0	358	132	132	0	1.30	294	59	352	173	32	235	8305	1.31
East Fork Nehalem	14,244	4,353	0	710	81	991	11	1.74	159	0	1,785	1470	906	1058	8022	2.05
Elk Creek (Nestucca)	6,326	5,127	0	255	8	98	32	1.27	39	0	295	174	134	493	4883	1.40
Fall Creek	19,193	5,789	0	803	178	332	0	1.32	213	106	905	206	159	1118	15673	1.33
Gooseneck Creek	6,221	2,726	0	255	8	213	149	1.48	88	442	1,005	156	149	116	3855	1.94
Kilchis Frontal	2,814	854	0	94	6	158	13	1.58	0	85	127	247	242	149	1866	1.71
Lower Lobster	18,547	6,856	56	668	41	476	122	1.35	14	528	1,442	433	207	1050	14002	1.50
Lower So Fk Alsea	11,886	6,126	13	521	50	314	250	1.43	163	148	829	608	142	459	8725	1.55
Mill Creek	22,062	9,561	0	714	43	2,220	33	1.92	392	112	1,702	2135	2022	1372	13554	1.90
Moon Creek	12,593	5,392	0	367	21	382	130	1.37	129	129	874	743	514	1139	8566	1.67
North Fork Alsea	20,670	11,960	0	846	101	663	157	1.43	341	170	1,545	879	695	1142	14822	1.61
North Fork Siletz	25,320	10,149	0	1,136	60	1,427	230	1.63	575	0	1,428	1748	1668	1772	16718	1.69
Pedee Creek	7,685	2,119	0	336	21	766	70	1.97	0	180	1,196	857	857	271	3909	2.27
Quartzville Creek	64,041	21,228	313	1,560	59	1,574	1988	1.37	506	0	5,052	62	62	5798	48616	1.43
Rowell-Gold Creek	10,609	3,145	32	399	27	566	28	1.57	92	152	1,522	183	130	738	7319	1.78
Table Rock Fork	22,956	13,838	0	825	49	645	0	1.35	448	0	564	1902	1353	34	13679	1.52
Testament Creek	4,406	2,909	3	204	13	143	74	1.47	84	12	423	509	11	449	2604	1.89
Upper Lobster	9,063	8,077	0	337	33	184	0	1.30	247	0	480	91	11	494	7387	1.37
Upper Molalla River	22,469	10,842	1	984	88	1,440	94	1.68	367	0	3,358	1175	1105	1958	13365	2.00
Upper Nestucca	16,596	11,235	67	722	61	630	11	1.46	78	0	1,688	951	669	1263	10986	1.76
Upper Rickreall Ck	6,778	2,210	0	215	44	595	0	1.84	388	0	776	742	710	130	3823	2.18
Upper So Fk Alsea	19,742	12,576	68	939	208	516	0	1.42	301	0	1,052	1488	134	731	15201	1.53
Upper Willamina	25,486	11,231	53	994	86	845	0	1.40	192	178	2,412	1629	254	1554	18319	1.69

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Silvicultural Practices T(+10) Tractor Piling (Acres)	B(+10) Burning Recent (Acres)	H Herbicides (Last Year) (Acres)	F Fertilization (10Yr/10) (Acres)	P PCT (5 Yrs) (Acres)	SI Silvic. Practices Rating	RIPARIAN RATING S(+10) Seedlings/ Saplings (Acres + I/O)	P(+10) Pole Timber (Acres + I/O)	T(+10) Small Saw Timber (Acres + I/O)	L(+10) Large Saw Timber (Acres + I/O)	R Total Riparian (Acres)	RI Riparian Rating
Alsea Frontal	257	247	250	15	600	1.09	215	898	2294	741	3981	1.43
Bear Creek (Salem)	0	29	0	40	75	1.06	10	26	128	119	273	1.33
Bible Creek	105	35	0	0	22	1.20	10	30	85	234	349	1.26
Clear Ck (Kilchis)	18	56	0	0	0	1.12	75	14	202	0	285	1.56
Crooked Creek	65	8	50	0	100	1.07	17	195	623	211	1033	1.39
East Fork Nehalem	727	255	4,100	498	0	2.15	194	192	434	235	999	1.51
Elk Creek (Nestucca)	16	31	0	11	87	1.05	26	108	286	192	600	1.37
Fall Creek	253	35	300	20	500	1.16	63	120	807	267	1217	1.39
Gooseneck Creek	99	28	0	151	0	1.17	9	31	258	53	348	1.38
Kilchis Frontal	139	34	70	0	0	1.47	298	401	88	85	616	1.96
Lower Lobster	108	70	0	0	200	1.07	205	736	1069	595	2434	1.47
Lower So Fk Alsea	249	87	0	0	200	1.20	95	243	772	266	1321	1.43
Mill Creek	2654	149	0	2	0	1.93	274	130	1149	330	1850	1.45
Moon Creek	88	137	20	0	104	1.10	102	51	115	472	720	1.33
North Fork Alsea	374	133	150	20	400	1.19	296	359	726	885	2137	1.42
North Fork Siletz	893	280	0	430	40	1.33	270	248	1301	405	2194	1.44
Pedee Creek	399	171	0	4	300	1.50	150	103	441	0	683	1.56
Quartzville Creek	628	12	0	0	480	1.08	266	1235	1782	421	3440	1.51
Rowell-Gold Creek	544	24	0	3	10	1.39	20	33	421	94	556	1.38
Table Rock Fork	484	370	0	74	133	1.23	423	551	790	30	1635	1.65
Testament Creek	55	96	0	0	36	1.18	17	46	202	63	311	1.42
Upper Lobster	73	15	0	0	200	1.08	26	207	374	67	648	1.47
Upper Molalla River	585	220	0	0	0	1.23	311	630	813	205	1817	1.57
Upper Nestucca	71	172	120	54	273	1.10	118	167	782	917	1923	1.33
Upper Rickreall Ck	278	126	400	0	30	1.51	124	72	385	118	692	1.47
Upper So Fk Alsea	199	268	100	0	400	1.15	54	154	1065	630	1863	1.34
Upper Willamina	397	292	0	0	200	1.17	98	227	1553	907	2726	1.34

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Mining Rating N Notices (#)	M Stream (Miles)	MI Mining Rating	Soils S1*K1/W Ave K* Factor	KI Soils Rating	Slope/Aspect S Slopes >60% (Acres)	A Critical Aspects (Acres)	AI Slope/ Aspect Rating	Drainage DD Drainage Density (Mi/Sq Mi)	DI Drainage Density Rating	Precip P Ave Storm 2Yr-24Hr. (Inches)	PI Precip Rating
Alsea Frontal	0	340	1.00	0.22	1.76	563	236	1.13	5.270	1.42	4.5	1.56
Bear Creek (Salem)	0	28	1.00	0.21	1.72	0	293	1.40	4.603	1.37	5.5	1.69
Bible Creek	0	31	1.00	0.24	1.83	2	137	1.27	4.142	1.33	5.5	1.69
Clear Ck (Kilchis)	0	31	1.00	0.25	1.89	168	112	1.62	6.904	1.55	4.5	1.56
Crooked Creek	0	70	1.00	0.19	1.65	242	283	1.39	4.542	1.36	5.0	1.63
East Fork Nehalem	1	88	1.09	0.28	1.97	0	148	1.15	3.954	1.32	2.5	1.31
Elk Creek (Nestucca)	0	45	1.00	0.18	1.62	19	285	1.25	4.542	1.36	6.0	1.75
Fall Creek	0	354	1.00	0.13	1.46	852	306	1.42	11.805	1.94	5.5	1.69
Gooseneck Creek	0	84	1.00	0.24	1.86	287	83	1.33	8.640	1.69	4.0	1.50
Kilchis Frontal	1	34	1.24	0.27	1.94	114	56	1.46	7.642	1.61	4.5	1.56
Lower Lobster	0	238	1.00	0.12	1.43	397	114	1.17	8.216	1.66	5.0	1.63
Lower So Fk Alsea	0	79	1.00	0.22	1.78	219	138	1.18	4.233	1.34	5.0	1.63
Mill Creek	0	148	1.00	0.21	1.72	901	336	1.33	4.282	1.34	5.5	1.69
Moon Creek	0	63	1.00	0.24	1.82	269	1,009	1.91	3.204	1.26	5.5	1.69
North Fork Alsea	0	145	1.00	0.18	1.63	232	413	1.20	4.499	1.36	5.0	1.63
North Fork Siletz	0	156	1.00	0.17	1.58	1,073	947	1.59	3.949	1.32	7.5	1.94
Pedee Creek	0	48	1.00	0.21	1.72	7	84	1.18	3.984	1.32	4.5	1.56
Quartzville Creek	50	451	1.89	0.13	1.44	6,674	2,546	1.98	4.505	1.36	5.0	1.63
Rowell-Gold Creek	0	142	1.00	0.19	1.66	361	63	1.24	8.537	1.68	5.5	1.69
Table Rock Fork	0	198	1.00	0.14	1.49	1,298	1,954	1.86	5.508	1.44	4.0	1.50
Testament Creek	0	42	1.00	0.17	1.61	28	224	1.36	6.063	1.49	5.5	1.69
Upper Lobster	0	60	1.00	0.14	1.48	563	362	1.47	4.209	1.34	5.5	1.69
Upper Molalla River	0	189	1.00	0.14	1.47	1,456	1,387	1.84	5.380	1.43	4.5	1.56
Upper Nestucca	0	256	1.00	0.17	1.60	94	404	1.18	9.890	1.79	5.5	1.69
Upper Rickreall Ck	0	46	1.00	0.17	1.60	191	265	1.64	4.339	1.35	6.0	1.75
Upper So Fk Alsea	0	122	1.00	0.20	1.70	88	69	1.04	3.958	1.32	4.5	1.56
Upper Willamina	0	368	1.00	0.22	1.78	37	538	1.21	9.249	1.74	4.5	1.56

Appendix 3-H Watershed Condition Index (Current Condition) (cont.)

Watershed Name	Flow Q 2 Yr. Flood (cfs/sq. mi.)	FI Flow Rating	Landslide U Unstable Soils (Acres)	LI Land Slide Rating	WCI (PA) Future Watershed Condition Index	WCI (PVT) Future Watershed Condition Index	WCI Current Watershed Condition Index
Alsea Frontal	67.6	1.35	33,318	1.75	42.4	39.4	41.3
Bear Creek (Salem)	96.5	1.51	3,882	1.90	46.8	41.6	45.6
Bible Creek	100.7	1.53	4,774	1.90	52.4	46.0	53.2
Clear Ck (Kilchis)	76.5	1.40	2,836	1.90	89.9	89.2	53.5
Crooked Creek	89.0	1.47	9,904	1.90	35.6	34.3	36.2
East Fork Nehalem	21.8	1.11	4,076	1.33	73.1	66.5	49.7
Elk Creek (Nestucca)	118.0	1.62	6,322	1.90	38.3	37.7	40.7
Fall Creek	104.0	1.55	19,192	1.90	56.8	56.4	60.4
Gooseneck Creek	69.3	1.36	6,208	1.90	75.3	75.1	75.6
Kilchis Frontal	76.5	1.40	2,478	1.80	173.9	172.5	45.5
Lower Lobster	86.8	1.46	18,534	1.90	39.5	38.1	41.8
Lower So Fk Alsea	88.3	1.46	10,928	1.84	46.5	40.3	38.1
Mill Creek	86.1	1.45	22,082	1.90	146.2	144.9	43.4
Moon Creek	105.7	1.55	12,606	1.90	72.9	69.2	59.2
North Fork Alsea	86.4	1.45	20,608	1.90	46.6	45.8	37.8
North Fork Siletz	179.9	1.94	25,318	1.90	125.2	124.4	80.2
Pedee Creek	82.4	1.43	6,630	1.79	112.5	112.2	106.5
Quartzville Creek	74.9	1.39	64,038	1.90	100.7	100.7	118.2
Rowell-Gold Creek	111.4	1.58	10,596	1.90	93.7	92.8	107.8
Table Rock Fork	58.5	1.31	22,672	1.89	61.3	57.0	34.7
Testament Creek	110.3	1.58	4,398	1.90	76.1	56.3	69.6
Upper Lobster	107.1	1.56	9,060	1.90	41.0	39.7	52.3
Upper Molalla River	71.7	1.38	22,482	1.90	102.9	101.9	88.2
Upper Nestucca	82.1	1.43	16,620	1.90	58.4	56.0	53.4
Upper Rickreall Ck	137.1	1.72	6,766	1.90	180.9	178.8	85.9
Upper So Fk Alsea	70.8	1.37	19,726	1.90	31.8	25.2	26.4
Upper Willamina	70.5	1.37	25,474	1.90	56.8	48.3	52.2

Appendix 3-I
List of Wildlife Species and Primary Habitat Affinities in the Salem District and Description of Federal Candidate Species

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Northwestern Salamander		X			X	X	X			X	
Long-toed Salamander		X	X	X						X	
Pacific Giant Salamander				X	X	X	X				X
Olympic Salamander					X	X	X	X			X
Clouded Salamander		X	X	X							
Oregon Slender Salamander				X		X					
Ensatina		X	X								
Dunn's Salamander				X	X	X	X	X			X
Larch Mt. Salamander				X	X	X		X			
Western Redback Salamander		X	X	X	X	X	X	X		X	X
Roughskin Newt		X	X	X	X	X	X				X
Western Toad		X	X		X		X				
Pacific Tree Frog		X	X	X	X	X	X		X	X	
Tailed Frog		X	X	X	X	X	X		X	X	
Red-legged Frog				X		X					

[1] Primary habitat is breeding, feeding, or resting habitat within the respective seral stages and unique habitats (after Brown 1985).

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Cascade Frog				X							
Foothill Yellow-legged Frog				X			X				
Bullfrog				X							
Spotted Frog[2]		X			X						
Painted Turtle		X	X		X		X	X			
Western Pond Turtle		X	X		X		X	X			
Leatherback Sea Turtle	X										
Loggerhead Sea Turtle	X										
Green Sea Turtle	X										
Pacific Ridley Sea Turtle	X										
Northern Alligator Lizard		X	X				X				
Western Fence Lizard		X	X		X	X					
Western Skink		X	X		X	X	X	X			
Rubber Boa		X	X							X	
Racer		X									
Sharptail Snake							X	X		X	X

[2] Extirpated

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Ringneck Snake		X	X				X			X	X
Gopher Snake							X				X
Western Aquatic Garter Snake							X				X
Western Terrestrial Garter Snake							X			X	X
Northwestern Garter Snake		X									
Common Garter Snake							X			X	X
Western Rattlesnake								X		X	
Common Loon	X						X				
Pied-billed Grebe							X				
Horned Grebe	X										
Red-necked Grebe	X										
Eared Grebe	X						X				
Western Grebe	X						X				
Brown Pelican	X										
Brandt's Cormorant	X							X			
Double-crested Cormorant	X										
American Bittern	X						X				
Great Blue Heron	X			X			X				X

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Great Egret	X			X			X				X
Green-backed Heron	X						X				X
Black-crowned Night Heron	X						X				X
White-faced Ibis[3]											
Tundra Swan	X						X				
Trumpeter Swan	X						X				
White-fronted Goose	X						X				
Snow Goose	X										
Brandt	X										
Canada Goose	X						X				
Wood Duck					X	X	X		X		X
Green-winged Teal	X						X				
Mallard	X						X				
Northern Pintail	X						X				
Blue-winged Teal	X						X				
Cinnamon Teal							X				
Northern Shoveler	X						X				

[3] Accidental

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Gadwall	X						X				
Eurasian Wigeon	X						X				
American Wigeon	X						X				
Canvasback	X						X				
Redhead	X						X				
Ring-necked Duck							X				
Greater Scaup	X						X				
Lesser Scaup	X						X				
Harlequin Duck	X			X	X	X	X				
Oldsquaw	X										
Common Goldeneye	X						X				
Barrow's Goldeneye	X				X	X	X		X		X
Bufflehead	X				X	X	X		X		X
Hooded Merganser					X	X	X		X		X
Common Merganser					X	X	X		X		X
Ruddy Duck	X						X				
Turkey Vulture	X	X						X		X	X
Osprey	X						X		X		X

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Black-shouldered Kite							X				X
Bald Eagle	X					X	X		X		
Northern Harrier								X			
Sharp-shinned Hawk				X	X	X					
Cooper's Hawk				X	X	X					X
Northern Goshawk					X	X					
Red-tailed Hawk		X				X					X
Rough-legged Hawk						X					
Ferruginous Hawk[3]											
Golden Eagle		X				X					
American Kestrel		X							X		X
Merlin	X						X				
Peregrine Falcon	X							X			
Ring-necked Pheasant							X				
Blue Grouse		X	X	X	X	X				X	
Ruffed Grouse							X			X	X

[4] No primary habitat orientation for listed habitats (Brown 1985).

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
California Quail[4]											
Mountain Quail		X									
Virginia Rail						X					
Sora						X					
American Coot	X						X				
Sandhill Crane							X				
Black-bellied Plover	X										
Lesser Golden Plover	X										
Snowy Plover	X										
Semipalmated Plover	X										
Killdeer	X						X				
Greater Yellowlegs	X						X				
Lesser Yellowlegs	X						X				
Solitary Sandpiper	X						X				
Willet	X										
Wandering Tattler	X										
Spotted Sandpiper	X						X				

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Whimbrel	X										
Long-billed Curlew							X				
Marbled Godwit	X										
Ruddy Turnstone	X										
Black Turnstone	X										
Surfbird	X										
Red Knot	X										
Sanderling	X										
Semipalmated Plover	X						X				
Western Sandpiper	X										
Least Sandpiper	X						X				
Baird's Sandpiper	X						X				
Pectoral Sandpiper	X						X				
Sharp-tailed Sandpiper							X				
Rock Sandpiper	X										
Dunlin	X										
Stilt Sandpiper[4]											

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Buff-breasted Sandpiper	X										
Short-billed Dowitcher	X										
Long-billed Dowitcher	X						X				
Common Snipe	X						X				
Wilson's Phalarope	X										
Red-necked Phalarope	X										
Red Phalarope	X										
Franklin's Gull	X										
Bonaparte's Gull	X						X				
Heerman's Gull	X										
Mew-Gull	X						X				
Ring-billed Gull	X										
California Gull	X						X				
Herring Gull	X						X				
Thayer's Gull	X										
Western Gull	X							X			

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Glaucous-winged Gull	X							X			
Glaucous Gull	X										
Sabine's Gull	X										
Caspian Tern	X										
Common Tern	X	X									
Arctic Tern	X										
Forster's Tern[4]											
Black Tern							X				
Common Murre	X							X			
Pigeon Guillemot	X							X			
Tufted Puffin	X							X			
Marbled Murrelet	X					X					
Rock Dove	X							X			
Band-tailed Pigeon	X						X				X
Mourning Dove							X				X
Common Barn-owl		X					X		X		
Western Screech-owl							X		X		X
Great Horned Owl		X			X	X	X				X

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Northern Pygmy-owl				X	X				X		
Burrowing Owl[4]											
Spotted Owl						X					
Barred Owl					X	X			X		X
Long-eared Owl		X					X				X
Short-eared Owl							X				
Northern Saw-whet Owl		X			X	X			X		X
Common Nighthawk	X	X					X	X			
Black Swift Swift[4]											
Vaux's Swift		X	X			X	X		X		X
Anna's Hummingbird							X				X
Rufous Hummingbird		X	X		X		X				X
Belted Kingfisher	X						X	X	X		X
Lewis' Woodpecker									X		
Acorn Woodpecker									X		

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Red-breasted Sapsucker							X		X		X
Downy Woodpecker							X		X		X
Hairy Woodpecker					X	X			X		
Black-backed Woodpecker									X		
Northern Flicker		X			X	X			X		X
Pileated Woodpecker						X			X		
Olive-sided Flycatcher					X	X					
Western Wood-Pewee			X		X	X					X
Willow Flycatcher							X				
Hammond's Flycatcher					X	X					
Pacific Slope Flycatcher						X	X				X
Western Kingbird[4]											
Eastern Kingbird							X				X
Horned Lark	X										
Purple Martin	X						X		X		X
Tree Swallow		X				X	X		X		X

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Violet-green Swallow							X	X	X		X
Northern Rough-winged Swallow							X	X			
Bank Swallow							X	X			
Cliff Swallow	X						X	X			
Barn Swallow	X						X				
Gray Jay			X	X	X	X	X				
Steller's Jay			X	X	X	X	X				
Scrub Jay[4]											
American Crow	X						X				X
Common Raven		X	X		X	X		X			X
Black-capped Chickadee							X		X		X
Chestnut-backed Chickadee			X	X	X	X	X		X		
Bushtit[4]											
Red-breasted Nuthatch					X	X	X		X		
White-breasted Nuthatch							X		X		X
Brown Creeper					X	X	X		X		

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Bewick's Wren							X			X	X
House Wren							X		X	X	X
Winter Wren					X	X				X	X
Marsh Wren							X				
American Dipper	X						X				
Golden-crowned Kinglet				X	X	X					X
Ruby-crowned Kinglet		X	X		X	X					X
Western Bluebird							X		X		X
Mountain Bluebird									X		
Townsend's Solitaire		X	X		X	X		X		X	X
Swainson's Thrush		X	X	X	X	X	X				X
Hermit Thrush		X	X		X	X	X				X
American Robin		X	X	X			X				X
Varied Thrush					X	X					
Wrentit											X
Water Pipit	X						X				
Cedar Waxwing							X				X

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Northern Shrike							X				
Loggerhead Shrike							X				
European Starling							X		X		X
Solitary Vireo					X	X					
Hutton's Vireo							X				X
Warbling Vireo							X				X
Orange-crowned Warbler		X	X				X				X
Nashville Warbler											X
Yellow Warbler							X				X
Yellow-rumped Warbler		X	X	X	X	X					X
Black-throated Gray Warbler		X	X	X	X	X	X				X
Townsend's Warbler					X	X					
Hermit Warbler				X	X	X	X				
MacGillivray's Warbler							X				X
Common Yelllowthroat							X				

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Wilson's Warbler							X				X
Western Tanager		X			X	X					
Black-headed Grosbeak							X				X
Lazuli Bunting							X				X
Rufous-sided Towhee		X	X				X				X
Chipping Sparrow		X	X				X				X
Vesper Sparrow											X
Lark Sparrow											
Savannah Sparrow							X				
Fox Sparrow							X				X
Song Sparrow							X				X
Lincoln Sparrow							X				
Golden-crowned Sparrow	X						X				
White-crowned Sparrow		X					X				X
Dark-eyed Junco		X	X		X	X					X

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Red-winged Blackbird	X						X				
Western Meadowlark[4]											
Yellow-headed Blackbird							X				
Brewer's Blackbird	X	X					X				X
Brown-headed Cowbird		X	X				X				X
Northern Oriole							X				X
Rosy Finch								X			
Purple Finch			X		X	X					X
House Finch	X										
Red Crossbill					X	X					
White-winged Crossbill[4]											
Pine Siskin		X	X	X	X	X	X				X
Lesser Goldfinch							X				X
American Goldfinch	X						X				X
Evening Grosbeak		X	X	X	X						
Virginia Opossum							X		X	X	X
Pacific Water Shrew							X			X	X

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Masked Shrew		X	X	X	X	X					
Dusky Shrew				X	X	X	X			X	X
Pacific Shrew		X					X			X	
Water Shrew							X			X	X
Trowbridge's Shrew	X			X	X	X				X	X
Vagrant Shrew		X					X				
Shrew-mole				X	X		X			X	X
Broad-footed Mole		X					X				
Coast Mole		X	X								
Townsend's Mole		X									
Big Brown Bat		X				X	X	X	X		X
Silver-haired Bat			X	X	X	X			X		X
Hoary Bat		X	X		X	X	X				X
California Myotis		X	X	X	X	X	X	X	X		X
Long-eared Myotis					X	X	X		X		X
Little Brown Myotis		X		X	X	X	X	X	X		X
Long-legged Myotis		X	X		X	X	X		X		X

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Yuma Myotis		X			X	X	X	X	X		X
Townsend's Big-eared Bat			X				X	X			X
Coyote		X	X				X	X		X	
Gray Fox										X	
Red Fox		X					X			X	
Black Bear		X	X	X	X	X	X			X	
Raccoon	X	X	X	X	X	X	X		X	X	X
River Otter	X						X				X
Marten					X	X			X	X	
Fisher					X	X		X	X	X	
Striped Skunk							X				
Ermine		X		X	X	X				X	
Long-tailed Weasel		X	X							X	
Mink	X						X			X	X
Spotted Skunk		X	X				X	X		X	X
Badger[4]											
California Wolverine							X				
Mountain Lion		X	X		X		X	X			
Bobcat		X	X				X	X		X	X
Northern Sea Lion	X										

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Harbor Seal	X										
Roosevelt Elk		X	X	X	X	X	X				X
Black-tailed Deer		X	X	X	X						X
Columbian White-tailed Deer							X				
Mountain Beaver		X	X							X	
Northern Flying Squirrel					X	X			X		
Western Gray Squirrel									X		
California Ground Squirrel		X									
Townsend's Chipmunk			X	X	X	X			X	X	
Douglas Squirrel			X	X	X	X			X		
Camas Pocket Gopher		X					X				
Western Pocket Gopher		X									
Beaver							X				X
Bushy-tailed Woodrat				X	X	X		X		X	

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Dusky-footed Woodrat		X	X	X	X	X					X
Deer Mouse		X	X						X		X
White-footed Vole					X	X	X				X
Red Tree Vole				X	X	X					
Western Red-backed Vole				X	X	X					X
Long-backed Vole		X					X	X			X
Montane Vole								X			
Creeping Vole		X	X				X			X	X
Townsend's Vole		X					X				
Muskrat							X				
House Mouse											
Norway Rat											
Black Rat											
Pacific Jumping Mouse	X	X					X				
Porcupine		X	X	X	X	X		X		X	
Nutria							X				
Pika								X			
Snowshoe Hawk		X									

Appendix 3-I List of Wildlife Species and Primary Habitat Affinities in the Salem District (cont.)

Species	Coastal	Early Seral	Mid Seral	Late Seral	Mature	Old Growth	Riparian/ Wetland	Cliff/ Talus	Snags	Dead & Downed	Hardwoods
Black-tailed Jackrabbit											
Brush Rabbit		X	X		X						X
Eastern Cottontail							X				

The following are descriptions of federal candidate species.

Townsend's Big-eared Bat

The Townsend's big-eared bat is a candidate for listing on the federal threatened and endangered species list.

Caves and cave-like structures are important habitat for the big-eared bat as winter hibernating sites and as roosts for summer nursery colonies. The species will also use abandoned mine tunnels and buildings. Other important habitat features include wet meadows, caves, estuaries, and riparian areas (Brown 1985). There are no known big-eared bat habitat sites on BLM-administered land in the planning area.

White-footed Vole

The white-footed vole is a candidate for listing on the federal threatened and endangered species list.

The white-footed vole is primarily associated with coastal riparian zones, preferring alder and small streams (Maser et al. 1981). The species is the rarest member of the vole family in North America. There are no known white-footed vole habitat sites on BLM-administered land in the planning area.

Larch Mountain Salamander

The Larch Mountain salamander is a candidate for listing on the federal threatened and endangered species list. The salamander is considered rare in Oregon because of its limited range and habitat destruction caused by urbanization and road construction.

The Larch Mountain salamander prefers dense stands of Douglas-fir with considerable moss and humus. This is usually in association with lava talus slopes of Columbia River basalt or Cascade andesite. Moist soils are preferred substrates. There are no known Larch Mountain salamander habitat sites on BLM-administered land in the planning area. Isolated tracts in Multnomah County fall within the range of this species and are considered potential habitat.

Northern Goshawk

The northern goshawk is a candidate for listing on the federal threatened and endangered species list. Goshawk nesting is believed to occur above the 1900 foot elevation in the Cascades. Research indicates that the birds require dense overstories of mature or old-growth trees and sparse ground cover for successful foraging and nesting. These conditions generally apply to the nest site, nest stand, and forage area. Nests are typically in one of the largest trees in the nest stand. They are usually situated on large limbs, against the bole of the tree, beneath, or just above the lower branches of the tree canopy. Nest sites are usually on north exposures of gentle to moderate slope. Sites in steep topography are usually situated on benches, or at the bottom of steep slopes. Nest sites are often associated with quiet streams or springs (Coleman Crocker-Bedford 1990, Hall 1984, Reynolds et al. 1982, Reynolds 1983).

Goshawk nesting densities are approximately four pairs per township in suitable habitat (Reynolds 1983). Nest stands approximate 400 acres and are associated with large tracts (i.e., nearly 5,000 acres) of older forest for foraging (Coleman Crocker-Bedford 1990). Goshawks appear to be highly sensitive to environmental changes. For example, Coleman Crocker-Bedford (1990) determined that large buffers did not maintain nesting when timber sales were conducted within the home range of the birds. They recommended managing for the species through extended (old-growth) rotations on a watershed basis in order to maintain 2,500 to 5,000 acres of older forest around nest sites at all times. Timber harvest activities that open forest canopies and encourage the development of dense vegetation on the forest floor appear to be detrimental to goshawk foraging, and hence reproduction.

The goshawk is believed to be scarce in the Salem District with only one historic nest site reported. No formal inventories have been conducted.

Red-legged Frog

The red-legged frog is a candidate species on the federal threatened and endangered list. Red-legged frogs prefer ponds and low-gradient streams generally at elevations below 2,000 feet. Breeding sites provide moisture, food, and refuge from non-aquatic predators. Red-legged frogs use rodent holes to retain body moisture during periods of low relative humidity (Applegarth 1991). The red-legged frog has recently become scarce in the Willamette Valley (St. John 1987). It seems to be absent from most streams and ponds in western Oregon (Applegarth 1991). The reason for this decline is not clear (Hays and Jennings 1986). However, the presence of introduced sport species such as bass, bluegill, and bullfrog, usually corresponds with the local absence of the red-legged frog (Applegarth 1991).

Western Pond Turtle

The western pond turtle is a candidate species on the federal threatened and endangered species list. Habitat of the western pond turtle in western Oregon is permanent water generally under 2,000 feet elevation. Preferred habitat seems to be a combination of quiet and fairly clear water, emergent rocks or logs, some aquatic vegetation, and nearby sunlit ground. The turtle is found in ponds with soft bottoms, rocky pools and streams (Evenden 1948; Applegarth 1991). Clear water probably favors this species because a major part of its diet consists of invertebrates that are visually located and pursued (Bury 1986). Activities which are thought to have resulted in declines of pond turtles include: flood control, tillage and road construction adjacent to ponds, chemical drainage into ponds, removal of logs and rocks from stream channels, and introduction of exotic plants and animals (Applegarth 1991). Locations of western pond turtles on BLM-administered lands are not well documented.

Spotted Frog

The spotted frog is a candidate for listing on the federal threatened and endangered species list. Throughout its range, the spotted frog seems to favor lakes and slow moving streams. Generally these frogs are associated with permanent water where the bottom is soft-muddy or boggy which may be needed for hibernation. The spotted frog is apparently scarace in western Oregon due to the introduction of the bullfrog which preys on spotted frogs. In the past, spotted frogs were found at scattered locations at all elevations in western Oregon (Nussbaum et al. 1983). There remains a small possibility that an isolated population of spotted frogs still survives in western Oregon, but no known sites presently occur on BLM-administered lands.

Harlequin Duck

The harlequin duck is a candidate for listing on the federal threatened and endangered species list. It winters along the Pacific Ocean shoreline in Oregon and nests along swift streams in interior Oregon. Two summer locations have been identified in the Salem District along the North Santiam River and the Molalla River.

Mountain Quail

The mountain quail is a candidate for listing on the federal threatened and endangered species list. The mountain quail is a permanent resident in western Oregon. It occurs in brushy hill and mountainous areas throughout the planning area. Preferred habitat is brushy areas in cutovers, old burns, and along edges between dissimilar habitat types. Preferred food includes fruits, seeds, and vegetable matter.

Pacific Fisher

The Pacific fisher is a candidate for listing on the federal threatened and endangered species list. Breeding habitat is usually restricted to mature and old-growth forests, although foraging may occur in younger successional stages. Large downed logs serve as denning sites. These logs are frequently found in older seral stages. Use of younger successional stages for reproduction may be possible however, provided that suitable denning sites are available. There are no known Pacific fisher sightings on BLM-administered land in the planning area.

Appendix 3-J
Fish Species in Salem Planning Area Streams

Nonsalmonid	Salmonid
River lamprey	*Chum salmon
Western brook lamprey	*Coho salmon
Pacific lamprey	Sockeye salmon (kokanee)
Green sturgeon	*Chinook salmon
White sturgeon	Mountain whitefish
American shad	*Cutthroat trout
Threadfin shad	*Steelhead (rainbow trout)
Longfin smelt	Brown trout
Eulachon	*Bull trout
Olympic mudminnow	Dolly Varden
Chiselmouth	
Common carp	
*Oregon chub	
Peamouth	
Squawfish *Ptychocheilus* spp.	
Dace *Rhinichthys* spp.	
Shiners *Richardsonius* spp.	
Tench	
Suckers *Catostomus* spp.	
Bullheads *Ictalurus* spp.	
Channel catfish	
Sand roller	
Burbot	
Mosquitofish	
Threespine stickleback	
Striped bass	
Rock bass	
Sunfishes *Lepomis* spp.	
Smallmouth bass	
Largemouth bass	
White crappie	
Black crappie	
Yellow perch	
Walleye	
Sculpins *Cottus* spp.	

* Priority species
Source: Brown 1985

Appendix 3-K Stream Habitat Quality Rating

The rationale for using riparian tree size (dbh) to rate stream habitat quality is based on research (Sedell etal.1988), inventory data, and the field experience of BLM fishery biologists. Data from these sources indicate the size of trees in adjacent riparian areas is directly related to stream habitat quality and fish populations. Trees in riparian areas fall into streams and create desirable habitat conditions. Tree size information is available in the BLM Operations Inventory and was used for making the initial stream habitat quality rating.

A related factors analysis was completed to determine if other factors should be considered in making a final habitat quality rating. There are many interrelated physical and biological factors that affect the quality of fish habitat and fish populations. In addition to tree size in riparian areas, other factors include amount of water diversion, amount of sediment yield, availability of natural structure, presence of beaver dams or side channels, or presence of rehabilitation structures. Some of these factors are not inventoried for all BLM stream segments. Therefore, the district biologist determined which of the known factors were most important in making a final habitat rating.

Using the initial rating based on tree size and the related factors analysis, conditions of all streams were rated as minimal, fair or good/optimal. Initial ratings were downgraded on 17 miles of stream. On four miles of stream, ratings were changed from fair to good/optimal.

The characteristics of the condition classes are as follows:

Minimal Major alterations in watershed or water quality and quantity conditions, natural stream habitat and riparian areas; few or no large trees present in riparian areas with most 0-11 inches dbh; little or no large woody debris; pools few and shallow; heavy sedimentation of streambed by sand and silt; stream productivity for aquatic life drastically reduced; fish populations at only 10-25 percent of potential.

Fair Watershed moderately impacted by activities; riparian vegetation altered by past events or activities, few large trees present with most 11-21 inches dbh; physical stream conditions substantially altered from natural conditions because of past or present activities, e.g., limited amount of large woody debris and fine sediments in pools and riffles above natural amounts; some adverse changes in water quality and quantity; habitat partly recovered or still decreasing in trend; stream moderately productive for aquatic life, but fish populations far below potential (approximately 50 percent).

Good/Optimal Watershed not greatly impacted by activities or mostly recovered and in good condition; riparian areas in good condition with diverse vegetation including large trees over 21 inches dbh; physical stream conditions only slightly altered with nearly complete recovery or virtually unchanged from natural conditions, e.g., abundant and diverse instream structure including large woody debris, numerous deep pools, bottom substrate relatively free from fine sediments, adequate spawning gravels, and stable banks and channels; water quality and quantity (temperature, turbidity, flow, etc.) generally unaltered from natural conditions; stream producing near or at its potential for salmon, trout, and other native fishes.

Appendix 3-L
Present Condition of Existing and Potential Special Areas

Special Area	Present Condition
Existing	
Big Canyon ACEC/ ONA	Much of the caution zone has been clearcut and more is expected in the future. No timber related impacts were observed in the primary zone, although feeder stream riparian zones were not buffered in the caution zone in past clearcuts. Natural values of the ACEC primary zone remain intact.
Carolyn's Crown ACEC/RNA	The natural character of the area remains intact; the population of *Polystichum andersonii* (Anderson's sword fern) is healthy and vigorous.
Elk Creek ACEC	Recent monitoring of this ACEC indicates that the values for which this area was designated to protect remain intact. Bald eagle habitat remains unchanged.
Grass Mountain ACEC/RNA	Most of the grass bald complex has not been disturbed since 1974 (grazing lease). Some of the area has been disturbed by off-road vehicle (ORV) use and a small communication site development. The area has been closed to ORV use. Under the current RNA/ACEC designation, no new disturbances are permitted.
High Peak-Moon Cr. ACEC/RNA	Recent monitoring of this ACEC indicates that the natural characteristics for which this area was designated have remained intact with little or no adverse impacts.
Larch Mtn. Env. Educ. Area	Recent monitoring indicates that the integrity of this area has been maintained.
Little Grass Mtn. ACEC/ONA	The natural values for which this ACEC was designated to protect have been preserved. Little evidence of incompatible use has been observed during recent monitoring.
Little Sink ACEC/ RNA	Recent monitoring indicates that the integrity of the ACEC is being maintained. Current and potential threats identified during monitoring include ORV use, increased recreational impacts and introduced plant species.
Lost Prairie ACEC	Monitoring indicates that the population of *Anemone oregana var. felix* (bog windflower) remains stable while the *Erythronium elegans* (Coast Range fawn lily) population is declining for unknown reasons. A clearcut adjacent to the bog is currently undergoing shrub and forb succession. A small population of trout has been observed in the pond.
Mary's Peak ACEC/ ONA	Evidence of increased ORV and other recreational use was observed during recent monitoring. It has been determined that this activity has not damaged the integrity of the ACEC. Further monitoring is necessary to access potential impacts in the future.

Appendix 3-L (cont.)

Special Area	Present Condition
Middle Santiam Terrace ACEC	Few recent adverse impacts within the ACEC have been observed, and past windthrow on the northeastern edge has begun to stabilize. Litter and other impacts from fishermen along the river was observed.
Nestucca River ACEC	Recent monitoring indicates that the ACEC has maintained a B scenic quality rating, although some changes have occurred. High visitor use to and around the existing recreation sites within the ACEC has resulted in increased litter, unauthorized trails and other adverse impacts. However, the overall integrity of the ACEC has been maintained, and plant species of special interest remain intact.
Rickreall Ridge ACEC	Evidence of motorcycle use has been observed in the primary zone and *Senecio jacobea* (tansy ragwort) is invading an area adjacent to the ACEC. Neither is impacting the natural character of the ACEC at this time. Rehabilitation of a fire trail is being hampered by erosion caused by heavy deer and elk use.
Saddleback Mtn. ACEC/RNA	Some windthrow has been observed in two areas of the primary zone in the past. A new population of *Scoliopus hallii* (Oregon fetid adder's tongue) has been found on a rock outcrop on the highest point in the RNA.
Sandy River Gorge ACEC/ONA	Little adverse impact has been observed during recent monitoring, and natural values within the ACEC remain intact.
Sheridan Peak ACEC	Few incompatible use impacts have been observed during recent monitoring. *Poa marcida* (weak bluegrass) habitat has been degraded somewhat by the presence of young *Abies procera* (noble fir) establishment. Other natural features remain intact.
Soosap Meadows ACEC	The meadow continues to flourish and provide important habitat for area plants and animals. No visible adverse impacts have been recently observed.
The Butte ACEC/ RNA	The integrity of the natural values within the ACEC remains intact. Little or no adverse impacts have been observed during recent monitoring.
Valley of the Giants ACEC/ONA	No adverse impacts have been observed during recent monitoring. The integrity of the ACEC has been maintained. This may be at least partially due to very low visitor use, estimated at 300 visits/year.
Willamette River Parcels	Several small parcels, including Wells Island, located within the state designated Willamette River Greenway. Habitat within these parcels includes open river bars, successional vegetation, riparian vegetation, and sloughs. Some parcels provide an example of habitat in pre-settlement condition.

Appendix 3-L (cont.)

Special Area	Present Condition
Williams Lake ACEC	Extensive windthrow has occurred in the N.E. portion of the caution zone and to a lesser extent around the lake, (two areas in the primary zone and one area on private land). Harvest of windthrow on the private land in 1985 may lead to the failure of the wet seep slope. High recreational use has caused trampling of portions of the sphagnum and other lakeside vegetation. Unauthorized campfire use is evident on the north side of the lake.
Yaquina Head ACEC/ONA	Populations of *Crambe maritima* (sea kale), *Lasthenia minor ssp. maritima* (coast lasthenia) and *Romanzoffia tracyi* (coast mistmaiden) remain healthy and vigorous. Human impact to the area has lessened since the installation of improved trails and protective fencing. Visitor use remains high and some impact in the intertidal zone area has been observed.
Potential	
A. J. Dwyer Scenic Area	The width of the corridor was reduced by recent highway construction. Otherwise, the values of the corridor are intact.
Alsea Bay Island Potential ACEC/RNA	The island is constantly changing due to natural processes. Any minor disturbances caused by bird watching, clam digging or camping are quickly erased by wind and water.
Forest Peak Potential ACEC/RNA	Recent monitoring indicates that this area receives very little visitor use and that the overall integrity of the site has been maintained. An adjacent timber sale is planned for FY93.
Eagle Creek Protection Area	The area immediately above the fish hatchery is relatively undisturbed, but upslope areas are highly dissected and subject to unacceptable damage if vegetation is removed.
North Santiam Potential ACEC	The overall natural integrity of this parcel remains relatively intact. A small trail into the great blue heron rookery has been recorded.
Shafer/Crabtree Creek Potential ACEC/RNA	The spur road to Crabtree Lake has been blocked to decrease vehicular disturbance to the south side of the lake and areas above the lake. Overall integrity of the resource values have been maintained.
Walker Flat Potential ACEC	Recent monitoring indicates that the integrity of this potential ACEC has remained intact. Low visitor use may have contributed to this finding. Adjacent clearcuts have had negligible impact on the botanical value of the area.
Wells Island Potential ACEC	Recent monitoring indicates a disappearance of *Sagittaria latifolia* (arrowhead) from unknown causes. Low visitor use has resulted in no adverse impacts. The overall integrity of the area has been maintained.
White Rock Fen Potential ACEC	The natural values for which this area was nominated remain intact. No current management activity is occuring in the vicinity of this potential ACEC.

Appendix 3-L (cont.)

Special Area	Present Condition
Wilhoit Springs Potential ACEC	The values of this potential ACEC have been maintained, and little incompatible use has been observed during recent monitoring.
Yampo (Eola Hills) Potential ACEC	Recent monitoring indicates that the *Lathyrus holochlorus* (Willamette peavine) population has declined along the road due to herbicide drift by an adjacent landowner. Future impacts may be unavoidable due to the small size of the ACEC and the edge effect that occurs over the entire potential ACEC site.
Yellowstone Creek Potential ACEC	The scenic quality of this area remains one of the highest in the district. No visual impacts have been observed from within the adjusted ACEC boundary, and only marginal impacts were observed in the preliminary boundary during recent monitoring.

Source: District special area files

Appendix 3-M
Identification and Screening of Candidate ACECs

During the 1990s RMP process, the public, BLM employees, and other government agencies identified 28 areas with resource values that might meet ACEC criteria. These areas became candidate areas. To be a potential ACEC, a candidate area must meet the importance and relevance criteria. Each candidate area was screened by an interdisciplinary team (IDT) to determine if these criteria were met. If met, the IDT proposed boundaries and management objectives for the potential ACEC. The IDT recommendations were then made to the area managers for decisions on which areas to be considered as ACECs in the RMP and to the district manager for concurrence. The results of this process are summarized below.

Candidate ACEC Screening Results

Candidate ACEC	Nomination Source	Nomination Acres	Historic, Cultural or Scenic Value	Fish or Wildlife Habitat Value	Natural System, Bot., Geol. Value	Special Status Species	Hazard Area	Meets Relevance Criterion	Meets Importance Criterion	Potential ACEC Acres[1]
Alsea Bay Island	BLM	11	N	Y	Y	Y	N	Y	Y	10
Forest Peak	PNRS[2]	140	N	Y	Y	N	N	Y	Y	134
North Santiam	Public	22	N	Y	Y	N	N	Y	Y	31
Shafer/Crabtree Cr.	BLM	1,606	Y	Y	Y	Y	N	Y	Y	961
Walker Flat	Public	400	N	N	Y	Y	N	Y	Y	39
Wells Island	BLM	62	N	Y	Y	N	N	Y	Y	67
White Rock Fen	BLM	51	N	N	Y	N	N	Y	Y	51
Wilhoit Springs	BLM/Pub.	149	Y	N	Y	N	N	Y	Y	170
Yampo (Eola Hills)	BLM	13	N	N	Y	Y	N	Y	Y	13
Yellowstone Cr.	BLM	113	Y	Y	Y	Y	N	Y	Y	112
Brightwood Bog	BLM	10	N	N	Y	N	N	Y	N	N/A
Cape Lookout	BLM	40	N	N	Y	Parcel transferred to Oregon State Parks				
Cedar Patch	BLM	40	N	N	Y	Nomination not completed				
Clackamas River	Public	53	N	N	Y	N	N	Y	N	N/A
Clear Cr. Rim Slope	BLM/Pub.	8	N	N	N	Parcel is no longer in federal ownership.				
Down and Out	BLM	27+	N	N	Y	N	N	Y	N	N/A
Grassy Overlook	BLM	8-32	N	N	Y	N	N	Y	N	N/A
Little N.F. Wilson	BLM/Pub.	1,400	N	Y	Y	Y	N	N	N	N/A
Lost Creek Meadows	BLM	100	N	N	Y	Nomination not completed				
Lukens Creek	Public	500	N	N	Y	N	N	N	N	N/A
Parker Creek	BLM	5	Y	N	N	Nomination withdrawn				
Ringo	Public	66	N	N	Y	N	N	N	N	N/A

Candidate ACEC Screening Results (cont.)

Candidate ACEC	Nomination Source	Nomination Acres	Historic, Cultural or Scenic Value	Fish or Wildlife Habitat Value	Natural System, Bot., Geol. Value	Special Status Species	Hazard Area	Meets Relevance Criterion	Meets Importance Criterion	Potential ACEC Acres[1]
Siletz River	BLM	7	N	N	Y	N	N	N	N	N/A
Sleepy Hollow	Public	640	Y	Y	N	N	N	Y	N	N/A
Table Mtn.	BLM	640	N	Y	Y	N	N	Y	N	N/A
Tally Creek	BLM	125	N	N	Y	N	N	N	N	N/A
Waterloo	Public	11	N	N	Y	N	N	N	—	N/A
Willamette River	Public	8-19	N	N	Y	Cadastral survey needed				

[1] Derived from WODDB.
[2] Pacific Northwest Research Station (USFS)
Source: District special area files

Appendix 3-N
Cultural Resource Inventory Procedures

Three classes of inventory are included in the BLM's standard, nationwide cultural resource inventory program. Class I inventory consists of a review of existing data and compilation of this data into a cultural resource overview document.

Class II inventories are field sampling strategies. They are designed to gather statistically valid data to provide objective estimates of the nature and distribution of cultural resources in a defined study area. Areas selected for a class II inventory are surveyed at the same intensity as for a class III inventory.

Class III inventories are intensive field inventories designed to identify and record all cultural resource sites within a specific location. Typically, class III inventories are used in advance of projects that may cause disturbance or result in the destruction of sites. Heavily vegetated, steep, and highly dissected terrain commonly characterize BLM lands in western Oregon. These conditions make class III inventories nearly useless for pre-project site identification. Therefore, a fourth class of inventory, the reconnaissance inventory, is used specifically on heavily vegetated sites in western Oregon in advance of projects with site-disturbing potential.

The reconnaissance inventory consists of trained individuals walking on landform features with potential for cultural resources to be present and viewing the ground surface and/or subsurface as possible, given the dense ground cover. This means observing fallen tree root wads and holes, rodent burrows, road margins, and game trail surfaces as well as purposefully removing duff from the ground surface. The use of reconnaissance inventories in western Oregon has been addressed in the current Cooperative Agreement between the Oregon State Historic Preservation Office and the Bureau of Land Management's Oregon State Office.

A class I inventory of all Salem District BLM-administered land was conducted in 1980 and published in the same year (Minor etal.1980). The overview has not been updated. Class II inventories have not been undertaken on BLM-administered lands in the planning area.

Class III inventories have been conducted on the district for very small projects such as communication site applications; for linear projects such as timber sale access roads; and for post-project surveys such as after completion of timber harvest and slash reduction on timber sale units. Approximately 5,000 acres of the district's total 393,600 acres have been inventoried at the class III level.

Reconnaissance inventories have mostly been performed on timber sale harvest units. Approximately 36,000 acres have been surveyed using reconnaissance inventory techniques.

The eligibility of some cultural resource sites for inclusion in the National Register of Historic Places has been assessed using criteria described in 36 CFR 6.

Appendix 3-O
Wild and Scenic River Eligibility and Classification Criteria

The first step in proposing additional rivers as components of the National Wild and Scenic River System is to determine if the rivers are eligible. To qualify, a river must be free flowing and have at least one outstandingly remarkable value (ORV). These ORVs are stated in the Wild and Scenic Rivers Act as "scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values". The act did not specifically spell out the criteria to judge these values. The BLM westside Oregon districts developed criteria (see BLM Instruction Memoranda No. OR-89-632 and No. OR-89-632, Change 1) which, in part, follow:

A river's scenic, recreational, geologic, fish, wildlife, cultural, and/or historic value(s) are deemed "outstandingly remarkable" if one or more of the following guidelines apply to the value(s) under consideration.

Scenic: The landscape elements of landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modifications are unique and harmonious. The rating area must be scenic quality "A" as defined in the Visual Resource Inventory Handbook, H-8410-1, Illustrations 1 and 2 (USDI, BLM 1986). When analyzing scenic values, additional factors such as seasonal variations in vegetation, scale of cultural modifications, and length of time negative intrusions are viewed may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment length and not common to other rivers in the geographic region.

Recreational: Recreational opportunities exist or have the potential to be unique enough to attract visitors from outside the geographic region. Visitors would be willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but not be limited to, sightseeing, wildlife observation, photography, hiking, fishing, hunting, and boating.

Interpretive opportunities may be exceptional and attract or have the potential to attract visitors from outside the geographic region.

The river may provide or have the potential to provide settings for national or regional commercial usage or competitive events.

Geologic: The river or the area within the river corridor contains an example(s) of a geologic feature, process, or phenomena that is rare, unusual, one-of-a-kind, or unique to the geographic region. The feature(s) may be in an unusually active state of development, represent a "textbook" example, or represent a unique or rare combination of geologic features (erosional, volcanic, glacial, and other geologic structures).

Fish: Fish values may be judged on the relative merits of fish populations, habitat or a combination of these river-related conditions:

Populations: The river is nationally or regionally one of the top producers of resident or anadromous fish species. Of particular significance is the presence of wild or unique stocks or populations of federally listed or candidate threatened and endangered species.

Habitat: The river provides exceptionally high quality habitat for fish species indigenous to the region. Of particular significance is habitat for federally listed or candidate threatened and endangered species.

Wildlife: Wildlife values may be judged on the relative merits of wildlife populations, habitat, or a combination of these conditions:

Populations: The river or river area within the river corridor contains nationally or regionally important populations of indigenous wildlife species dependent on the river environment. Of particular significance are species considered to be unique or populations of federally listed or candidate threatened and endangered species which are so dependent.

Habitat: The river or area within the river corridor provides a principal food source, unique habitation site, or migration route for wildlife of national or regional significance, or for a federally listed or candidate threatened and endangered species. Contiguous habitat conditions are such that the biological needs of the species are met.

Cultural: The river or area within the river corridor contains a site(s) where there is evidence of occupation or use by Native Americans. Sites must be rare, one-of-a-kind, have unusual characteristics, or exceptional human interest value(s). Sites may have national or regional importance for

interpreting prehistory; may be rare and represent an area where a culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; or may have been used by cultural groups for rare or sacred purposes.

Historic: The river or area within the river corridor contains a sites(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare, unusual, or one-of-a-kind in the region. A historic site(s) or feature(s) in most cases is 50 years old or older. Of particular significance are sites or features listed in, or are eligible for inclusion in, the National Register of Historic Places.

Other Similar Values: While no specific evaluation guidelines have been developed for the "other similar values" category, it is assumed that districts will assess additional river-related values not covered in this attachment. This will be done in a manner consistent with the foregoing guidance, including, but not limited to hydrologic, ecologic/ biologic diversity, paleontologic, botanic, and scientific study opportunities.

After determining if a river segment is eligible for inclusion in the National Wild and Scenic Rivers System, the next step is to determine the potential classification. This is based on the condition of the river and the adjacent lands at the time of eligibility determination. Section 2. (b) of the Wild and Scenic Rivers Act provides three classifications. They are:

Wild River Areas: Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail. Watersheds or shorelines are essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic River Areas: Those rivers or sections of rivers that are free of impoundments. Shorelines or watersheds are still mostly primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational River Areas: Those rivers or sections of rivers that are readily accessible by road or railroad may have some development along their shorelines and may have undergone some impoundment or diversion in the past.

The Federal Register, Vol. 47, No. 173, September 7, 1982, gives guidance for classifying rivers. It states that water quality, water resources development, shoreline development and accessibility are the criteria to be considered when determining classification. Each criterion is important, but its collective intent is more important. The basis for classification is the degree of naturalness of the river. The most natural rivers will be classified wild while the least natural rivers will be recreational. The following table further defines the four criteria.

Classification Criteria for Wild, Scenic, and Recreational Rivers

Attribute	Wild	Scenic	Recreational
Water Resources Development	Free of impoundment	Free of impoundment	Some existing impoundments or diversion.
			The existence of low dams, diversions or other modifications of the waterway is acceptable, provided the waterway remains generally natural and riverine in appearance.
Shoreline Development	Essentially primitive. Little or no evidence of human activity.	Largely primitive and undeveloped. No substantial evidence of human activity.	Some development Substantial evidence of human activity.
	The presence of a few inconspicuous structures, particularly those of historic or cultural values, is acceptable.	The presence of small communities or dispersed dwellings or farm structures is acceptable.	The presence of extensive residential development and a few commercial structures is acceptable.
	A limited amount of domestic livestock grazing or hay production is acceptable.	The presence of grazing, hay production or row crops is acceptable.	Lands may have been developed for the full range of agricultural and forestry uses.
	Little or no evidence of past timber harvest. No ongoing timber harvest.	Evidence of past or ongoing timber harvest is acceptable, provided the forest appears natural from the riverbank.	May show evidence of past and ongoing timber harvest.
Water Quality	Meets or exceeds federal criteria or federally approved state standards for aesthetics, for propagation of fish and wildlife normally adapted to the habitat of the river, and for primary contact recreation (swimming) except where exceeded by natural conditions.	No criteria prescribed in the Wild and Scenic Rivers Act. The Federal Water Pollution Control Act Amendments of 1972 have made it a national goal that all waters of the United States be made fishable and swimmable. Therefore, rivers will not be precluded from scenic or recreational classification because of poor water quality at the time of their study, provided a water quality improvement plan exists or is being developed in compliance with applicable federal and state laws.	

Classification Criteria for Wild, Scenic, and Recreational Rivers (cont.)

Attribute	Wild	Scenic	Recreational
Access-ability	Generally inaccessible except by trail. No roads, railroads, or other provisions for vehicular travel within the river area. A few existing roads leading to the boundary of the river area is acceptable.	Accessible in places by road. Roads may occasionally reach or bridge the river. The existence of short stretches of conspicuous or longer stretches of inconspicuous roads or railroads is acceptable.	Readily accessible by road or railroad. The existence of parallel roads or rail-roads on one or both banks as well as bridge crossings and other river access points is acceptable.

Source: The Federal Register, Vol. 47, No. 173, September 7, 1982

Appendix 3-P
Potential Wild, Scenic and Recreational River Eligibility Determinations and Proposals for Study

River Name	Segment Length (mi.)[1]	Outstand. Remarkable Values[2]	Eligibility Determination/ Potential Classification[3]	Percent BLM Acres[4]	BLM-Initiated Study[5]
Abiqua Creek	15.0	None	Not Eligible/NA	NA	NA
Alsea River	17.0	R,F	Eligible/Recr.	7	No
Butte Creek	13.0	None	Not Eligible/NA	NA	NA
Clackamas River	12.0	R,F	Eligible/Recr.	1	No
Crabtree Creek Segment A	2.2	S,R,W,C,E	Eligible/Scenic	100	Yes
Crabtree Creek Segment B	4.2	None	Not Eligible/NA	NA	NA
Crabtree Creek Segment C	15.0	None	Not Eligible/NA	NA	NA
Drift Creek Segment A (Alsea RA)	12.0	F	Eligible/Recr.	2	No
Drift Creek Segment B (Alsea RA)	16.1	F	Eligible/Recr.	.1	No
Drift Creek (Yamhill RA)	4.7	None	Not Eligible/NA	NA	NA
Eagle Creek	12.0	None	Not Eligible/NA	NA	NA
East Fork Dairy Creek	20.0	None	Not Eligible/NA	NA	NA
East Fork Nehalem River	9.0	None	Not Eligible/NA	NA	NA
Elkhorn Creek	3.0	S,W	Eligible/Wild	90	Yes
Fall Creek	9.8	F	Eligible/Recr.	15	No

Appendix 3-P (cont.)

River Name	Segment Length (mi.)[1]	Outstand. Remarkable Values[2]	Eligibility Determination/ Potential Classification[3]	Percent BLM Acres[4]	BLM-Initiated Study[5]
Kilchis River	11.5	R,F	Eligible/Recr.	2	No
Little Luckiamute River	25.0	E	Eligible/Recr.	.1	No
Little North Fork Wilson River	10.2	None	Not Eligible/NA	NA	NA
Little North Santiam River	18.0	S,R,F	Eligible/Recr.	16	No
Lobster Creek Segment A	4.6	F	Eligible/Recr.	100	Yes
Lobster Creek Segment B	15.6	F	Eligible/Recr.	3	No
Luckiamute River	52.0	C,E	Eligible/Recr.	.1	No
Lukens Creek	9.0	None	Not Eligible/NA	NA	NA
Middle Fork of the North Fork Trask River	5.0	None	Not Eligible/NA	NA	NA
Middle Santiam River	7.0	C,E	Eligible/Recr.	7	No
Mill Creek	22.0	None	Not Eligible/NA	NA	NA
Molalla River Segment A	11.0	None	Not Eligible/NA	NA	NA
Molalla River Segment B	12.4	S,R,G	Eligible/Recr.	84[6]	yes
Nehalem River	114.0	R,F	Eligible/Recr.	.1	No
Nestucca River Segment A	15.3	S,R,F	Eligible/Recr.	72	Yes
Nestucca River Segment B	7.0	R,F	Eligible/Recr.	5	No
North Fork Alsea River	10.7	S,F,W	Eligible/Scenic	53	Yes
North Fork Clackamas River	12.0	F	Eligible/Scenic	8	No

Appendix 3-P (cont.)

River Name	Segment Length (mi.)[1]	Outstand. Remarkable Values[2]	Eligibility Determination/ Potential Classification[3]	Percent BLM Acres[4]	BLM-Initiated Study[5]
North Fork Eagle Creek	4.5	None	Not Eligible/NA	NA	NA
North Fork Siletz River	9.0	F,W,E	Eligible/Scenic	36	No
North Fork Trask River	17.2	S,F	Eligible/Recr.	15	No
North Santiam River Segment A	20.0	S,R,F	Eligible/Scenic	4	No
North Santiam River Segment B	38.0	R,F	Eligible/Recr.	1	No
North Yamhill River	28.0	None	Not Eligible/NA	NA	NA
Rickreall Creek	28.0	None	Not Eligible/NA	NA	NA
Sandy River Segment A	12.6	R,F,C	Eligible/Recr.	9	No
Sandy River Segment B	11.6	S,R,F,C	Eligible/Recr.	1	No
Siletz River	68.0	S,R,F	Eligible/Recr.	.1	No
South Fork Alsea River	16.4	G	Eligible/Recr.	65	Yes
South Fork Trask River	11.0	F	Eligible/Recr.	2	No
South Scappoose Creek	15.0	None	Not Eligible/NA	NA	NA
South Yamhill River	50.0	C,E	Eligible/Recr.	.1	No
Table Rock Fork Molalla River	13.2	C	Eligible/Recr.	35	No
Thomas Creek	21.0	None	Not Eligible/NA	NA	NA
Trask River	16.4	R,F	Eligible/Recr.	1	No
Tualatin River	76.0	C	Eligible/Recr.	.1	No

Appendix 3-P (cont.)

River Name	Segment Length (mi.)[1]	Outstand. Remarkable Values[2]	Eligibility Determination/ Potential Classification[3]	Percent BLM Acres[4]	BLM-Initiated Study[5]
Walker Creek	2.5	E	Eligible/Recr.	54	Yes
Willamette River	160.0	R,F,W,C,E	Eligible/Recr.	.1	No
Wilson River	26.6	R,F,W	Eligible/Recr.	2	No
Yaquina River	38.0	F	Eligible/Recr.	.1	No

[1]Segment lengths are derived from WODDB-generated and hand calculated mileage.
[2]S = scenic; R = recreational; G = geologic; F = fish; W = wildlife;
C = cultural; E = ecological/botanical.
[3]A river and its environs can be eligible for inclusion in the National Wild and Scenic Rivers System if it is a free-flowing river and possesses one or more outstandingly remarkable values. Potential classifications are Wild, Scenic and Recreational (Recr.) river area. NA in this column means not applicable (since river is not eligible).
[4]Shoreline and adjacent lands within 1/4 mile of the river segment not to exceed 320 acres per mile measured from the ordinary high water mark on both sides of the river. NA in this column means not applicable (since river is not eligible).
[5]Suitability assessment will be completed by BLM in the RMP. NA in this column means not applicable (since river is not eligible).
[6]This percentage is based on acreage acquired through the Molalla land exchange completed in January 1992.
Source: District recreation inventory records

Appendix 3-Q
Special Recreation Management Areas

Wild and Scenic Rivers

Existing - Clackamas, Salmon (including Wildwood Recreation Site) and Sandy Rivers; and Quartzville Creek (including Dogwood and Yellowbottom Recreation Sites).

Potential - Crabtree, Elkhorn, Lobster and Walker Creeks; and Molalla, Nestucca, North Fork Alsea and South Fork Alsea Rivers.

Recreation Sites

Existing - Fishermen's Bend

Recreation Areas

Existing - Yaquina Head Outstanding Natural Area and Nestucca River Corridor.

Potential - Crabtree Lake, Green Peter Peninsula, Marys Peak, Mill Creek, Mt. Hood Corridor and North Fork Siletz River.

Wilderness

Existing - Table Rock

Existing SRMA Acreage and Visitation

SRMA Name	BLM Acres	1990 Visits	Percent of Total Visitation
Clackamas Wild and Scenic River	120	—[1]	—[1]
Fishermen's Bend Recreation Site	141	28,000	5
Nestucca River Corridor	5,300	40,000	7
Quartzville Creek Wild and Scenic River	1,780	20,000	4
Salmon Wild and Scenic River (including Wildwood Recreation Site)	640	95,000	18
Sandy Wild and Scenic River	680	4,000	1
Table Rock Wilderness	6,028	3,000	<1
Yaquina Head Outstanding Natural Area	106	350,000	65
Grand Total	**14,795**	**540,000**	**100**

[1] No on-site visitation; BLM-administered lands part of general landscape upslope from river.

Appendix 3-R
Timber Inventory Systems

Before land use plan alternatives can be properly developed and considered for BLM-administered forest lands, information about the land must be available. Some of the most important information is related to the ability of the land to grow trees, the location and characteristics of the trees, and their growth rate and present volume. The BLM obtains this information primarily through three inventory systems: the TPCC, the Operations Inventory, and the Extensive Inventory.

Timber Production Capability Classification (TPCC)

As the first step in determining the amount of land available for timber production, the TPCC inventory serves to identify those BLM-administered lands which are physically capable of supporting a managed commercial forest. To be included in the timber base, a parcel of land must have sufficient soil depth, moisture, drainage, and stability to sustain the growth, harvest, and reforestation of a commercial forest through many rotations, without suffering degradation of its productive capacity. The TPCC provides four basic categories of land: (1) Suitable Commercial Forest land, (2) Suitable Woodland, (3) Nonsuitable Woodland, and (4) Nonforest land.

Suitable commercial forest lands are considered capable of supporting intensive production of timber on a long-term basis. There may be some limitations due to fragile soil or reforestation problems, but management practices are available to help offset or mitigate the identified problems.

Suitable woodlands do not meet the requirements for suitable commercial forest, but are still capable of providing some forest products. This category includes lands which are suitable for growth of only noncommercial tree species, lands which are classified as low site, and lands with identified reforestation problems which would prevent restocking to minimum levels within five years of harvest.

Nonsuitable woodlands are forested lands with serious fragile conditions. Logging activity would cause serious damage to the productivity of the site, and management practices to mitigate or avoid the damage are not available or not feasible.

Nonforest lands are not considered capable of becoming at least ten percent stocked with forest trees, because of site characteristics such as rock, water, or extremely shallow soil, or because the area has been permanently converted to nontimber uses such as roads, rock quarries, utility corridors, or building sites.

A detailed description of the TPCC fragile classifications is contained in the second part of appendix 2-D.

The 1990 TPCC acre totals are displayed in table 3-31 of this document. BLM State Office Handbook 5251-1, Timber Production Capability Classification (USDI, BLM 1986a), provides a complete description of the TPCC system, and is available for inspection at the district office.

Operations Inventory

For BLM to carry out the timber management program effectively, specific information as to the location and current condition of the various forest types within the land base must be available to managers. This is accomplished through the Operations Inventory (OI), in accordance with procedures contained in the Operations Inventory Handbook.

The OI is an intensive inventory which divides the forests into survey units which are sufficiently uniform in species composition, tree size, stand age, and other characteristics to distinguish them from adjacent units. Units are mapped in GIS and information relating to them is maintained in the MICRO*STORMS computer data base. Micro*Storms contains a wide variety of information for each OI unit, including location, size, timber stand type and condition, past management, silvicultural needs, and opportunities for application of intensive management practices.

Extensive Inventory

The Extensive Inventory consists of several hundred permanent inventory plot locations which are used to redetermine the existing volume of timber on district forest lands approximately every ten years. The extensive inventory procedures, also known as Continuous Forest Inventory (CFI), were developed by the U.S. Forest Service and the BLM. The procedures are

in standard use nationwide.

The inventory is a stratified random sample of the commercial forest land base in each of the district's four sustained yield units. Each plot is a cluster of five sample points, and each point is the center of a fixed and a variable-radius plot. The objective of the inventory is to estimate total conifer volume for each unit within plus or minus ten percent (two standard deviations).

A reinventory of the district's commercial forest land was completed in 1988. The volume on present stands was derived from analysis of measurements taken on 707 permanent plots. The majority of these plots were established in 1967-68 and were remeasured in 1978-79 and in 1986-88. Additional plots were established in 1979 and 1987 to increase the sample of younger stands and precommercially thinned stands. Inventory plots are stratified based on site index, age, and major TPCC type (Suitable Commercial Forest Land, Suitable Woodland, NonSuitable Woodland, and NonForest).

More information on inventories is available from the district office.

Appendix 3-S
Resource Management Activity and Concerns in and Near RIAs

RIA T. R.	BLM Acres[1]	Management Activity[2]	Expressed Concerns[3]	Remarks
1 N. 9 W.	54	no		
2 N. 2 W.	320	no		
2 N. 3 W.	100	yes	yes	Timber harvest disturbed horse riding trail
3 N. 2 W.	514	no		
4 N. 2 W.	162	yes	no	
4 N. 3 W.	191	yes	no	
1 S. 4 E.	587	no		
1 S. 5 E.	249	yes	no	
1 S. 4 W.	15	yes	yes	Adjacent neighbor concerned about proposed timber sale.
1 S. 5 W.	232	yes	no	
1 S. 7 W.	62	no		
1 S. 8 W.	2,157	yes	no	
1 S. 9 W.	602	yes	no	
2 S. 4 E.	490	no		
2 S. 5 E.	199	yes	no	
2 S. 6 E.	1,531	yes	yes	Proposed timber sale highly controversial
2 S. 7 E.	54	yes	yes	Proposed timber sale highly controversial
2 S. 3 W.	121	yes	no	
2 S. 5 W.	613	yes	no	
2 S. 6 W.	3	no		
3 S. 3 E.	1,153	yes	yes	Land exchange opposed by local citizens
3 S. 4 E.	307	no		
3 S. 5 E.	41	yes	yes	Inquiries by environmental group and local citizens regarding proposed timber sale
3 S. 5 W.	969	yes	no	
3 S. 8 W.	204	yes	yes	Timber sale might disturb water source
3 S. 9 W.	206	yes	no	

Appendix 3-S (cont.)

RIA T. R.	BLM Acres[1]	Management Activity[2]	Expressed Concerns[3]	Remarks
4 S. 2 E.	295	yes	yes	Inquiries by local citizens regarding proposed timber sale
4 S. 3 E.	1,151	yes	yes	Some neighbors concerned about proposed timber sale
4 S. 4 E.	320	yes	no	
4 S. 5 W.	280	yes	no	
4 S. 6 W.	592	yes	no	
4 S. 7 W.	115	yes	no	
4 S. 10 W.	38	no		
5 S. 2 E.	258	no		
5 S. 3 E.	53	yes	no	
5 S. 6 W.	80	yes	no	
5 S. 7 W.	1,236	yes	no	
6 S. 1 E.	179	yes	no	
6 S. 2 E.	1,950	yes	no	
6 S. 7 W.	195	yes	no	
6 S. 10 W.	2	no		
8 S. 3 E.	13	yes	no	
8 S. 4 E.	211	yes	no	
9 S. 1 E.	53	no		
9 S. 2 E.	1,116	yes	yes	Local residents protested timber sale and complained about possible water quality impacts
9 S. 3 E.	1,278	yes	no	
9 S. 4 E.	11	yes	no	
9 S. 10 W.	16	yes	no	
9 S. 11 W.	39	no		
10 S. 1 E.	2,070	yes	yes	Local residents inquired about FY 92 timber sale
10 S. 2 E.	2,248	no		
10 S. 3 E.	754	yes	no	
10 S. 1 W.	275	no	no	
10 S. 10 W.	21	yes	no	
11 S. 1 E.	1,094	yes	no	
12 S. 1 E.	155	no		
13 S. 2 W.	18	no	no	

Appendix 3-S (cont.)

RIA T. R.	BLM Acres[1]	Management Activity[2]	Expressed Concerns[3]	Remarks
13 S. 7 W.	1,939	yes	no	
13 S. 8 W.	81	yes	yes	Inquiries and concerns expressed about timber sale, road use and access.
13 S. 11 W.	71	yes	no	
14 S. 7 W.	1,284	yes	no	
14 S. 8 W.	3,778	yes	no	
14 S. 9 W.	435	yes	no	
15 S. 8 W.	1,412	yes	no	
15 S. 9 W.	130	yes	yes	Some neighbors concerned about proposed timber sale

[1] BLM-administered acres within 1/2-mile of 1 to 20-acre zoned areas.
[2] BLM management activity within 1/2-mile of 1 to 20-acre zoned areas; includes proposed, on-going, or completed road construction, timber harvest, mining operations, etc.
[3] Expressed concerns = neighbors' inquiries, protests, appeals, legal actions, etc., which require unplanned work.

Chapter 4
Appendices

Appendix 4-A
Sensitivity Analysis

Sensitivity analysis is a process of identifying specific trade-offs and opportunity costs associated with differing approaches to land use allocations and other decision elements. It examines possible changes in single elements of an alternative. Such analyses can help design a preferred alternative that best reconciles potential conflicts and optimizes overall benefits. Because of the number of land use allocation issues and plan alternatives, the BLM found it essential to limit and tightly focus the sensitivity analyses on the most sensitive or controversial issues; primarily on the mid-range alternatives. A number of sensitivity analyses considered early in the formulation of planning criteria were not conducted as the evolution of planning issues and alternatives diminished their relevance.

Some sensitivity analysis conclusions were reached by complex calculations using the detailed analytical tools available for analysis of effects of the full alternatives. Many other conclusions, however, were extrapolated and interpolated from analysis of impacts of the full alternatives. This approach, rather than direct calculation, was always taken where calculation of the impacts of the full alternatives was based on a ten-year timber management scenario developed for each alternative. The effort involved in developing and analyzing such a scenario for each sensitivity analysis was considered unwarranted, due to the time and cost involved.

The following sensitivity analyses were conducted:

—For alternatives B, C, D and the preferred alternative (PA), the changes in socioeconomic effects and the effects on anadromous fish populations of differing levels of riparian zone protection, including legally required protection (the alternative A standard). For the PA, the effects of substituting the alternative A and E levels and the level of protection suggested by the Scientific Panel on Late-Successional Forest Ecosystems in their watershed/fish emphasis option (Johnson et al. 1991). The estimated changes in ASQ were based on calculations of changes in riparian acreages excluded from planned timber harvest. Employment effects are linked only to ASQ since no anadromous fish population changes are expected in the short term.

—For alternative A, the changes in socioeconomic effects and the effects on spotted owl habitat if the management areas (old-growth emphasis areas, etc.) and timber management prescriptions of the preferred alternative were incorporated.

—For alternatives B, C, D and the PA, the changes in socioeconomic effects and the effects on spotted owl habitat of differing approaches to old-growth and mature forest protection. These options include:

- No specific old-growth and mature forest protection in alternative B.
- Managing the lands allocated for older forest retention in alternative B on a 250-year rotation, with explicit provision for replacement.
- Managing the lands allocated for timber production in alternative B on a 150-year rotation.
- Managing all lands allocated for timber production in alternatives B and C entirely under either of alternatives C's partial retention approaches.
- Managing the lands allocated for timber production entirely for 15-20 percent partial retention, but in the first decades not harvesting in the oldest 20 percent of them.
- Substituting the USF&WS proposed spotted owl recovery plan for the older forest or spotted owl protection approach in alternatives B and D.
- Managing lands outside the OGEAs in the PA under the 50-11-40 rule.
- Allocating the restoration and retention blocks of alternative C to 35 percent or more partial retention management.
- Accelerating density management in the restoration and retention blocks of alternative C in the first decade to the extent practical.
- A minimum harvest age constraint of 60 years in alternative D, compared with 40 years in D in many plans.
- Precluding all timber harvest in old-growth emphasis areas of the PA.
- No regeneration harvest of stands younger than cumulation of mean annual increment in the preferred alternative.
- No constraint on minimum age of stands subject to regeneration harvest in timber management emphasis areas of the PA (letting the harvest model select the age that maximizes sustainable ASQ in the decade of the plan).
- Foregoing planting genetically selected stock, vegetation management for release and precommercial thinning, fertilization, and stand conversion in the PA. Each practice is analyzed separately then all are analyzed together.

The conclusions of all these analyses are displayed in the following table, at the end of this appendix.

Sensitivity Analysis of Timber Management Prescriptions, Alternative A

Sensitivity Analysis	ASQ (MMCF)	First Decade (MMBF)	20th Decade (MMBF)
1. Highest ASQ	51.9	334	291
2. CMAI	45.6	294	268
3. 12" Min. Diameter	51.9	334	291
16" Min. Diameter	48.4	312	285
20" Min. Diameter	32.5	210	207
24" Min. Diameter	15.4	102	102
4. Base Program	46.7	302	269

In addition, some sensitivity analyses of previously prevalent timber management prescriptions were done for alternative A, as part of the analysis of the management situation. The analytical conclusions are displayed in the following table.

Also for the analysis of the management situation, economic efficiency analyses were done for the following intensive management practices: precommercial thinning, commercial thinning, fertilization, and brush and hardwood conversion. These efficiency analyses were based on forestry practices of the 1980s and are less applicable to alternative C and the PA; particularly since a primary emphasis of many practices in those alternatives is attainment of biological diversity objectives which are not readily valued in economic terms. The measure of economic efficiency is change in net present value (NPV). NPV is the sum of values of revenues less costs during the life of the stand, all values being discounted to the time of harvest of the previous stand. If the change in NPV from adding an intensive management practice is positive, it is considered economically efficient; that is, it adds more value than it costs.

All analysis, including discount rates, was based on values net of inflation. This is called using real prices instead of nominal prices. The basis of expected timber stumpage prices is the average BLM timber sale price for the 1984-1988 period. For the primary analyses, future real wood price increases were estimated at 1.2 percent annually, based on the U.S. Forest Service's 1989 Resources Planning Act assessment. A discount rate of four percent was used because it was considered to best represent the long-term outlook. Analyses of precommercial thinning, commercial thinning and fertilization for each site index were made of both understocked and well-stocked stands, assuming final harvest ages of 50, 60, 70 and 80 years. Generally, fertilization or a combination of fertilization and commercial thinning results in a positive NPV for stands harvested at age 60.

For comparison and sensitivity testing, identical analyses were made using the following alternative assumptions: (1) zero real wood price increase and four percent discount rate, (2) 1.2 percent real wood price increase and seven percent discount rate, and (3) zero real wood price increase and seven percent discount rate. Under the first assumption, commercial thinning results in a positive NPV in all tests and fertilization results in a positive NPV in about one-half of the analyses. Precommercial thinning analyses indicates a negative NPV in most analyses. Under the second assumption, commercial thinning again results in a positive NPV for all analysis and fertilization and precommercial thinning indicate a negative NPV for all analyses. Under the third assumption, the results were similar to those for the second assumption.

Analysis of hardwood, brush or grass site conversion to conifers focused on estimating the maximum amount which could be spent on the practice while achieving a positive NPV. Generalized conclusions about economic efficiency of this practice were not reached, as the cost of conversion varies widely from site to site. Among the relevant factors in site-specific analysis would be the stumpage value of any trees on a site. At 1.2 percent real wood price increase, with a four percent discount rate, up to $1,406 per acre could be spent if harvest at age 60 was expected. The maximum amount economically feasible for any site declines as harvest age lengthens. Under other economic assumptions tested, it is also lower.

Complete documentation of the Economic Efficiency Analysis is available in the district Analysis of the Management Situation.

Sensitivity Analysis of Land Use Allocations

Estimated Changes (Comparison to Base Alternative)

Allocation or Decision Element	Alt.	Base ASQ(MMCF)	Alt.	Changed Allocation ASQ (MMCF)	Changed Allocation Change (MMCF)	Average Annual Employment (Total Jobs)	Average Annual County Revenue ($)	Anadromous Fish Populations (200 Years)
Riparian Zone Protection	B	43.86	A	44.10	0.24	16	143,960	/1
			C	43.70	(0.16)	(11)	(95,973)	No Change
	C	17.14	A	17.30	0.16	11	109,917	/1
			B	17.20	0.06	4	41,219	No Change
			D	16.80	(0.34)	(23)	(233,575)	No Change
	D	17.26	A	18.10	0.84	56	573,332	/1
			C	17.80	0.54	37	368,570	No Change
			E	16.50	(0.76)	(52)	(518,729)	/1
	PA	21.53	A	22.00	0.47	32	315,568	No Change
			E	20.80	(0.73)	(50)	(490,138)	

Allocation or Decision Element	Alt.	Base ASQ(MMCF)	Alt.	Changed Allocation ASQ (MMCF)	Changed Allocation Change (MMCF)	Average Annual Employment (Total Jobs)	Average Annual County Revenue ($)	Spotted Owl Habitat (100 Years)	Biological Diversity (10 Years) Structural Diversity	Biological Diversity (10 Years) Old Growth
Old Growth and Mature Forest Protection or Management	A	51.92	PA Timber Management Areas and Prescriptions	24.30	(27.62)	(1,851)	(18,166,665)	+	+	+
	B	43.86	No Protection	49.60	5.74	385	3,443,041	–	–	–
			150 Year Rotation on Managed Lands	20.60	(23.26)	(1,558)	(13,952,112)	+	+	0
			15–20% Partial Retention on Managed Lands	20.10	(23.76)	(1,592)	(14,252,029)	+	+	0
			35%+ Partial Retention on Managed Lands	17.70	(26.16)	(1,753)	(15,691,627)	+	+	0
			Proposed Spotted Owl Recovery Plan	15.30	(28.56)	(1,914)	(17,131,226)	+	+	+
	C	17.14	All 15–20% Partial Ret.	18.00	0.86	59	590,606	0	0	0
			All 35+% Partial Ret.	16.00	(1.14)	(79)	(783,162)	+	+	+
			All 15–20% Partial Ret., No Harvest of Oldest	10.90	(6.24)	(431)	(4,286,782)	+	+	+
			35%+ Partial Retention in R&R Blocks	20.30	3.16	216	2,170,670	–	–	–

	D	17.26	Proposed Spotted Owl Recovery Plan	15.20	(2.06)	(142)	(1,406,028)	+	+	+
			60 Year Min. Harvest Age	15.70	(1.56)	(106)	(1,064,759)	+	+	+
	PA	21.53	50-11-40 Rule Outside OGEAs /2	19.90	(1.63)	(111)	(1,094,417)	+	+	+
			No Harvest, Old Growth Emphasis Areas	17.00	(4.53)	(308)	(3,041,539)	+	+	+
			No Harvest Below CMAI	21.53	0.00	0	0	0	0	0
			Unconstr. Min. Harvest Age, General Forest Management Areas	24.50	2.97	202	1,994,122	–	–	–
			Scientific Panel Watershed Protection /3	20.20	(1.33)	(90)	(892,991)	+	+	+

Allocation or Decision Element	Alt.	Base ASQ(MMCF)	Alt.	Changed Allocation ASQ (MMCF)	Changed Allocation Change (MMCF)	Average Annual Employment (Total Jobs)	Average Annual County Revenue ($)
Old Growth and Mature Forest Protection or Management	PA	21.53	No Genetic Stock	21.30	(0.23)	(16)	(154,427)
			No Release and PC Thinning	21.50	(0.03)	(2)	(20,143)
			No Fertilization	21.30	(0.23)	(16)	(154,427)
			No Stand Conversion	21.40	(0.13)	(9)	(87,285)
			No Intensive Management Practices (4 Preceding)	21.00	(0.53)	(36)	(355,853)

/1 Substituting alternative A's level of riparian protection for that of alternatives B, C, or D would result in maintenance of current anadromous fish populations (to the extent that BLM actions influence that) rather than the long-term increases predicted under alternatives B, C, and D.

/2 For additional discussion, see chapter 4, Special Status Species.

/3 Scientific Panel on Late-Successional Forest Ecosystems.

Note: (#) = negative number
+ = increasing
0 = no change negligible
– = decreasing

Appendix 4-B
Analytical Assumptions about Global Climate Change

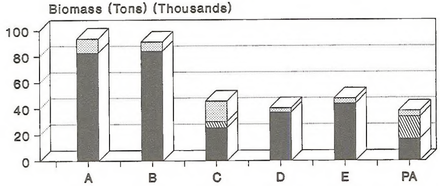
Many scientists have predicted significant global warming within the next sixty years, due to increasing levels of carbon dioxide and other gases in the atmosphere. Others have further hypothesized a climate change in western Oregon that would make it difficult or impossible to maintain, without change, the current ecosystems, including the major forest tree species. Among the relevant uncertainties, it is expected that warmer, drier weather would increase the incidence of wildfire, but warmer, wetter weather might reduce it. Rapid change may make the forest more susceptible to insect and disease attack because generational succession occurs much more quickly among pests than among trees. Other possible effects include raising soil temperatures and lengthening summer droughts. This could shift the range of Douglas-fir forest toward higher elevations, reduce the range for current high elevation species, and increase the range for dryland species such as lodgepole and ponderosa pine. Thus, management practices, particularly stand establishment and manipulation, could be affected. Assuring adequate tree regeneration would probably be the most serious management problem in areas that become marginal (Regens et al. 1989).

There is, however, no scientific consensus about the expected extent or rate of global warming or the probable effect on forest ecosystems in western Oregon. Neither the environmental record nor the limited capabilities of the climate models permit a reliable forecast of climate changes (NAS 1991). Furthermore, available models show marked differences in their predictions of change in western Oregon (Joyce et al. 1990). In addition, the most commonly predicted temperature changes are not expected to affect woody biomass production or the dominance of Douglas-fir in the region, although they could alter codominant species composition in older forests (Dale and Franklin 1989). At the high end of the range of predicted changes, however, are temperature increases that could be great enough, by around the middle of the 21st century, to inadequately meet the winter chilling requirement for Douglas-fir to start growth again in the spring (Lavender 1989).

The increasing carbon dioxide levels are generally thought to be beneficial to plant growth, but available information does not suggest which forest tree species may be most responsive to that increase or how their responsiveness may also be affected by any changes in climate or by fertilization in managed forests.

Although climate change may occur and may, in a number of decades, affect the species composition of the forest, it is not considered likely to affect forestry practices during the ten-year life of the plan. Nonetheless, the draft plan incorporates a process of adaptive management (see chapter 2, Management Direction Common to All Alternatives, Use of the Plan) permitting effective response to changing knowledge. Thus, should a scientific consensus emerge during the life of the plan, indicating that forestry practices should be modified promptly in anticipation of the effects of global warming, the BLM will be able to adjust.

Biomass Consumption by Alternative



	A	B	C	D	E	PA
Other Burn	10,937	7,214	15,625	3,178	3,759	4,287
Underburn	0	0	4,687	0	0	17,149
B. Burn	82,939	84,171	25,351	37,092	43,859	16,674

Alternative

Burn Type

B. Burn Underburn Other Burn

Average Annual Consumption

Figure 4-1

Appendix 4-C Soil Compaction, Erosion, and Nutrient Status

Maintenance of long-term soil productivity is a basic requirement of forest management. Soil and nonsoil factors influence soil productivity. Nonsoil factors, such as climate and geology, are not influenced by forest management activities. Soil factors which can be modified by management activities are soil moisture, soil aeration, organic matter and nutrient availability. The district's soils differ in their degree of sensitivity to disturbances. Determining the suitability of specific soils for management practices is an important first step in preventing or minimizing soils-related adverse impacts.

Soil disturbance usually is an unavoidable consequence of most management activities. The type and magnitude of disturbance determine the effects on soil productivity. Timber management practices, including road construction, are the dominant management activities which create disturbances such as compaction/displacement, erosion, and loss of organic material and nutrients.

Compaction/Displacement

Soil compaction can occur on all soils. Compaction causes reduced plant growth due to reduced water infiltration, and gaseous and nutrient exchange rates. Physical resistance to root growth can occur with high soil densities. Compaction may also affect populations of soil organisms, but resultant tree growth impact is unknown.

Soil displacement may affect plant growth, depending on distance moved, by removing nutrients and soil organisms, and by reducing available water and rooting depth.

Literature reports that detrimental soil compaction and displacement has a combined effect on growth. The growth effect of each is inseparable. Detrimental soil compaction is assumed to occur at depths greater than two inches and is evidenced by an increase in soil density of 15 percent or more (USFS standard in Forest Service Manual Supplement 45, Section 2520.4) over the undisturbed level. Most of this increase in density occurs after the first machine pass when soils are wet and after the first three to five passes when soils are relatively dry (McNabb and Froehlich, 1983, Steinbrenner, 1955). Power (1987) and Dyrness (1965) reported that detrimental soil compaction/displacement created by ground-based yarding covered 25 percent of a harvest unit. Wert and Thomas (1981) reported Douglas-fir growth loss of 43 percent on ground-based yarding skid trails and immediately adjacent (3 meters) areas that were 32 years old. Vanderheyden (1980) found no apparent compaction recovery after 38 years on a variety of soil textures in the Western Cascades of Oregon. Dyrness (1967) and Ruth (1967) reported soil disturbance created by high-lead and skyline cable yarding, but tree growth impacts from cable yarding are inconclusive.

Timber harvest and site preparation methods together with soil conditions during operation influence the degree of soil compaction and displacement. The yarding system utilized during harvest affects the amount of soil disturbed. The amount of compaction/displacement created by ground-based yarding primarily depends on the amount of the area in yarding trails, soil moisture during yarding, number of passes over each trail, and amelioration practices used. The more a log is suspended during yarding with a cable system, the less the soils are disturbed. Thus skyline systems generally disrupt less than high-lead systems (Dyrness 1967). The amount of soil compaction/displacement and tree growth losses created by mechanical site preparation varies with differing conditions (amount of material to be piled, soil moisture, machine type and operation, depth of organic matter layers, number of machine passes, etc.).

The amount of the area having detrimental soil compaction/displacement created by ground-based yarding can be minimized by using designated skid trails that are restricted to a predetermined percentage of the harvest unit (Froehlich, et. al. 1981; Garland, 1982; BLM Compaction Guidelines, 1983). Detrimental soil compaction created by mechanical site preparation can be minimized or avoided by utilizing a tracked backhoe/excavator and/or limiting the number of passes to two (forward and back) when soils are dry and most resistant to compaction. Tillage can fracture and ameliorate compacted soil. The degree of fracturing varies with tillage equipment, machine operation, and soil and site conditions (texture, moisture, coarse fragmented content, etc.). Andrus and Froehlich (1983) reported fracturing of approximately 80 percent for properly designed winged rippers. Davis (1990) reported bulk densities of compacted areas tilled with a self-drafting winged subsoiler were not significantly different than those in uncompacted areas. Soil structure and pores are not returned to their natural condition by tillage. No research has been conducted that correlates the degree of fracturing and restoration of soil density with the restoration of growth potential.

Soil Erosion and Mass Wasting (Landsliding)

Soil is an anchoring medium for plants and a reservoir of readily available water and nutrients for plant growth. Natural surface erosion rates in undisturbed forested areas of Western Oregon are very low. Overland flow of water is rare due to the usually thick protective cover of vegetation, duff and litter, and the high infiltration rate of the soils. Surface erosion and mass wasting are two types of soil erosion that affect long-term productivity of forest soils. Both are naturally occurring geologic processes involving gravity, soil water, precipitation events, etc.

Surface soil erosion, which includes sheet, rill, gully, and dry ravelling, is the detachment and movement of individual soil particles or aggregates downslope. It is caused either by the energy of rainfall and running water acting on bare soils, or by surface disturbance of steep slopes. In some of the higher elevation areas, freezing and thawing, especially on a daily basis, can cause considerable erosion on disturbed ground. This is particularly apparent in road cutbanks and areas with exposed soil.

Mass wasting (landsliding) is the downslope movement of soil and rock material. Volume of mass wasting events can range from a few cubic feet to thousands of cubic yards. Some of the more important factors that contribute to soil/slope instability are steep gradient, low soil strength, declining root strength, shallow soil depth, road construction, and a high frequency, duration, and intensity of precipitation.

There are several distinct types of mass movement. Debris avalanches and debris torrents are similar in that both occur on steep slopes, are fast moving, and are composed of soil, rock, water, and organic material. Torrents are water charged and occur in drainages, whereas avalanches lack the high water content and may or may not occur in drainages. These are the most dangerous types of landsliding and usually produce the most dramatic effects. Various slow moving types of mass movement such as shallow earth flows, rotational slumps, and deep-seated geologic events occur and are usually initiated by excessive water. Major concerns and impacts of mass wasting are public safety, private property, roads, bridges, water quality, and fisheries (see Chapter 4, Water Resources and Fish sections).

Current road construction practices have reduced the landslide frequency rate from pre-1975 road construction practices. High-lead systems may disturb 15-20 percent of the harvested area (Dyrness 1967). Skyline systems generally disturb less than 10 percent of the area, and aerial systems affect less than 5 percent of the ground (Dyrness 1967). Compaction, displacement, and mixing are the primary yarding disturbances. The significance of displacement and mixing of surface soils and organic materials on long-term productivity is unknown.

Reduction in root strength following timber harvest and site preparation activities may be a significant cause of landsliding in areas not associated with road construction. These changes match the high frequency of landslides the first few years following timber harvest on slopes with high potential for failure in Western Oregon (Burroughs and Thomas 1977). Areas most sensitive to loss of root strength and subsequent translational-type landsliding usually are over 70 percent slopes in concave positions, over hard bedrock in areas of high rainfall. Rotational-type landslides are less sensitive to the root strength factor but are sensitive to disturbances to soil and ground water and natural slope configuration.

Nutrient Status

Management of the surface organic material can strongly influence soil productivity because of the interdependence between above ground organic matter supplies and soil nutrient cycling and availability. Decaying plant components, including large downed woody debris, produce an organic layer on the soil surface which decomposes into soil organic matter. This provides plant nutrients, a supply of energy to soil microorganisms, and a medium for water storage. Soil microorganism activity has been directly linked to soil productivity (Harvey et al. 1979). Nitrogen is a limiting growth nutrient in many Pacific Northwest sites. The surface organic layer (duff) is a primary source of nitrogen for tree growth.

Soil organic matter accumulation and cycling are related to site index. When compared to lower site indices, higher sites have more organic matter incorporated into the soil and a larger nitrogen pool. Therefore, productivity is usually more resilient on higher sites. For maintenance of long-term productivity, conservation of organic matter on low sites is more important than on high sites.

Harvest and site preparation intensities and frequencies influence the amount and composition of the surface organic layer. Conservation of small materials (needles, leaves, twigs) is important for site nitrogen retention because these materials have the highest concentrations of nitrogen. When compared to needles and twigs, removal of large materials (stemwood and

large branches) has less effect on total nitrogen retention. However, the large materials are important for continuation of healthy symbiotic fungi populations (Maser et al 1978)

Soil Biology

Soil organisms work continually in carbon cycling, nutrient transfer, water availability, vegetation vigor, and maintenance of soil structure (Powers 1989). Mycorrhizal fungi enhance nutrient uptake of host plants by increasing the absorbing surface area of roots and through active physiological mechanisms (Amaranthus et al. 1989). When populations of soil organisms are healthy, few nutrients, such as nitrate, leach out of the system. The increased surface absorbing area also directly increases the total soil volume roots can explore for water.

Soil organisms are responsible for most biological fixation of nitrogen in ecosystems. Certain bacteria and actinomycetes form a mutually beneficial relationship with host plants and convert (symbiotic fixation) atmospheric nitrogen into ammonium nitrogen which is released into the host plant's roots (Amaranthus et al. 1989). Also, certain organisms that are not associated with host plants can convert atmospheric nitrogen (asymbiotic fixation). Some of these organisms are associated with wood-rotting fungi and mycorrhizal fungi (Amaranthus et al. 1989).

Mycorrhizae and other microbes affect soil structure by helping bind soil particles into water-stable aggregates which create soils with stable and adequate pore space. Soil pores are essential for adequate movement of water and air required by plant roots and soil organisms.

Data are lacking for addressing what reduces beneficial organism populations and how reduced populations affect soil productivity. Recent studies provide evidence for reasonable speculation. Long-term impacts to soil organisms can be minimized by implementing management practices that reduce soil disturbance severity, maintain organic matter levels, and emphasize revegetation by indigenous host species and associate soil organisms (Amaranthus et al. 1989)

Appendix 4-D FORCYTE-11 Model

The FORCYTE-11 (FORest nutrient Cycling and Yield Trend Evaluator) Model was developed in the late 1980s by Dr. J.P. Kimmins and K.A. Scoullar under contract to Forestry Canada (Kimmins and Scoullar 1990). It is a hybrid historical bioassay and ecological process-based simulation computer model that predicts forest yields. FORCYTE-11 was developed to examine the effects of altering the nutrient status of a site. FORCYTE-11 can simulate the growth, yield, and nutrient cycling in a wide variety of even-aged forests (Sachs et al. 1989).

The Salem District has used FORCYTE-11 to estimate long-term soil productivity trends for various management practices addressed in the Sensitivity Analysis of Timber Management Prescriptions of the Preferred Alternative. The trends are only used for relative comparisons because the model has not been validated against long-term experimental data.

Oregon State University's Department of Forest Science used a combination of literature and inventory data to calibrate FORCYTE-11 for western Oregon Douglas-fir sites (Sachs 1988). These data do not give a complete representation of all the ecosystem processes but are the best available at the present time. Research data indicates nitrogen is the limiting nutrient for most sites growing Douglas-fir in western Oregon. Therefore, nitrogen was the limiting nutrient used in the FORCYTE-11 simulations. Vegetative growth in FORCYTE-11 is influenced by available nitrogen.

FORCYTE-11 was used to estimate Douglas-fir total biomass production and site quality at an inherent, natural productivity level. This natural productivity level represents a baseline for comparisons of the various management prescriptions. This baseline (natural productivity level) is defined as Douglas-fir total biomass production estimated by FORCYTE-11 simulation over approximately 600 years, with maintenance of site quality and each rotation spanning a period equal to the culmination of mean annual increment. The natural productivity level was preceded by 900 years with no management practices and a fire frequency keyed to each specific management unit being analyzed. This 900-year scenario was judged to approximate natural stand dynamics prior to timber harvest and forest management. Therefore, any changes caused by management would be calculated from this baseline.

The following procedure was used for estimating nitrogen-related growth effects due to various management prescriptions:

1) The estimate of total Douglas-fir biomass for the inherent productivity of a natural stand growing until culmination of mean annual increment was converted to mean annual production.

Example: 4,536 metric tons/hectare produced over four 70-year (culmination of mean annual increment) rotations (280 years = evaluation timeframe).

$$\frac{4{,}536}{280} = 16.2 \text{ metric tons/hectare/year}$$

2) FORCYTE-11 was used to estimate Douglas-fir total biomass produced by various prescriptions in the Sensitivity Analysis of Timber Management Prescriptions for the Preferred Alternative. These total biomass figures were reported as mean annual production.

Example: Management prescription of 40-year rotations with no prescribed burn, no fertilization, and precommercial thinning at 13 years. 3,662 metric tons/hectare produced over six 40-year rotations (240 years = evaluation timeframe).

$$\frac{3{,}662}{240} = 15.3 \text{ metric tons/hectare/year}$$

3) The mean annual production estimates were used to calculate percent change from the inherent natural productivity level (baseline) for the various timber management prescription simulations.

Example:

$$\frac{15.3 \text{ (mean annual production)} - 16.2 \text{ (baseline)} \times 100}{16.2 \text{ (baseline)}} = -6\%$$

4) The degree and direction of the productivity trend for each simulated timber management prescription was estimated by using the percent change from the mean annual production and the annual production from the last simulated rotation.

Example:

$$\frac{16.5 \text{ (annual prod. last rotation)} - 15.3 \text{ (mean annual production)} \times 100}{15.3 \text{ (mean annual production)}} = +8\%$$

5) The FORCYTE-11 model tracks the limiting nutrient (nitrogen availability compared to the stand requirement for growth) through the cycles of simulated timber management prescriptions. The limiting nutrient site quality number is recorded for the end of each rotation.

The average site quality for the analysis is determined. The average site quality for each prescription is used to calculate the percent change from the baseline site quality.

Example:

Average Site Quality =

$$\frac{\text{120 (*site quality at end of rotation) + 130 + 132 + 134}}{\text{4 (number of rotations)}} = 129$$

Percent change from baseline =

$$\frac{\text{129 (average site quality) - 120 (baseline site quality)}}{\text{120 (baseline site quality)}} \times 100 = +7.5\%$$

6) The degree and direction of the site quality trend at the end of each timber management prescription simulation was estimated by using the percent change from the average site quality and the site quality at the end of the simulation.

Example:

$$\frac{\text{134 (site quality at end) - 129 (average site quality)}}{\text{129 (average site quality)}} \times 100 = +4\%$$

7) The percent change from the baseline level for each management prescription was categorized into the following trend classes:

Maintaining:	Change is + or - <10%
Increasing:	Change is + 11-20%
Decreasing:	Change is - 11-20%
Strongly Increasing:	Change is + >21%
Strongly Decreasing:	Change is - >21%

The following tables display the long-term productivity and site quality trend classes for various timber management practices that would be used under the various alternatives. The last set of tables displays long-term productivity and site quality trend classes for timber management practices anticipated under the preferred alternative.

Long-Term Soil Productivity Site Trend

Alsea Rickreall Site Index 123

AR123 MODERATE BURN Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	80	6	480	Decreasing	Maintaining	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Decreasing	Strongly Decreasing	Decreasing
3 PCT Only/CMAI	80	6	460	Decreasing	Maintaining	Strongly Decreasing	Maintaining
4 PCT Only/150 Year Rotation	160	4	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
5 PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
6 1Fert./CMAI	90	6	540	Decreasing	Maintaining	Strongly Decreasing	Maintaining
7 1Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Decreasing	Increasing
9 3Fert./CMAI	90	6	540	Maintaining	Maintaining	Decreasing	Maintaining
10 3Fert./160 Year Rotation	150	4	600	Maintaining	Maintaining	Decreasing	Maintaining
11 3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Increasing
12 PCT/3Fert./CMAI	70	6	560	Maintaining	Maintaining	Maintaining	Maintaining
13 PCT/2CT	80	6	460	Decreasing	Decreasing	Strongly Decreasing	Maintaining
14 PCT/1CT/CMAI	80	6	460	Decreasing	Decreasing	Strongly Decreasing	Maintaining
16 PCT/1CT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
16 PCT/2CT/3Fert./CMAI	70	8	660	Maintaining	Maintaining	Maintaining	Maintaining
17 Max Timber/D&E Debris Ret.	70	6	560	Maintaining	Maintaining	Maintaining	Maintaining
18 Max Timber @ 12" dbh	40	14	660	Strongly Decreasing	Strongly Decreasing	Strongly Decreasing	Decreasing
19 Max Timber @ 16" dbh	60	10	600	Maintaining	Decreasing	Decreasing	Maintaining
20 Max Timber @ 20" dbh	100	6	600	Increasing	Maintaining	Maintaining	Maintaining
21 Max Timber @ 24" dbh	180	3	540	Maintaining	Maintaining	Maintaining	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Maintaining	Strongly Increasing
23 20% Retention	300	2	600	Strongly Decreasing	Maintaining	Decreasing	Maintaining

Long-Term Soil Productivity Site Trend

Alsea Rickreall Site Index 123

AR123 LIGHT BURN Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	60	6	460	Maintaining	Maintaining	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Decreasing
3 PCT Only/CMAI	80	6	480	Decreasing	Maintaining	Strongly Decreasing	Maintaining
4 PCT Only/160 Year Rotation	150	4	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
5 PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Decreasing	Maintaining
6 1Fert./CMAI	90	6	640	Maintaining	Maintaining	Strongly Decreasing	Maintaining
7 1Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Decreasing	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Decreasing	Maintaining
9 3Fert./CMAI	90	6	540	Increasing	Maintaining	Maintaining	Maintaining
10 3Fert./160 Year Rotation	150	4	600	Increasing	Maintaining	Maintaining	Increasing
11 3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Increasing
12 PCT/3Fert./CMAI	70	8	560	Strongly Increasing	Maintaining	Increasing	Maintaining
13 PCT/2CT	60	6	460	Decreasing	Maintaining	Strongly Decreasing	Maintaining
14 PCT/1CT/CMAI	80	6	480	Decreasing	Maintaining	Strongly Decreasing	Maintaining
15 PCT/1CT/3Fert./CMAI	70	6	560	Strongly Increasing	Maintaining	Increasing	Maintaining
16 PCT/2CT/3Fert./CMAI	70	8	560	Strongly Increasing	Maintaining	Increasing	Maintaining
17 Max Timber/D&E Debris Ret.	70	8	660	Strongly Increasing	Maintaining	Increasing	Maintaining
18 Max Timber @ 12" dbh	40	14	560	Decreasing	Decreasing	Decreasing	Decreasing
19 Max Timber @ 16" dbh	60	10	600	Maintaining	Maintaining	Maintaining	Maintaining
20 Max Timber @ 20" dbh	100	6	600	Strongly Increasing	Maintaining	Maintaining	Maintaining
21 Max Timber @ 24" dbh	180	3	640	Increasing	Maintaining	Maintaining	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Maintaining	Maintaining	Maintaining	Strongly Increasing
23 20% Retention	300	2	600	Maintaining	Maintaining	Decreasing	Maintaining

Long-Term Soil Productivity Site Trend

Alsea Rickreall Site Index 123

AR123 NO BURN Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	60	6	460	Maintaining	Maintaining	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	6	600	Decreasing	Maintaining	Maintaining	Maintaining
3 PCT Only/CMAI	80	6	480	Maintaining	Maintaining	Strongly Decreasing	Maintaining
4 PCT Only/150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Increasing
5 PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Increasing
6 1Fert./CMAI	90	6	640	Increasing	Maintaining	Maintaining	Maintaining
7 1Fert./160 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
9 3Fert./CMAI	90	6	540	Increasing	Maintaining	Maintaining	Maintaining
10 3Fert./160 Year Rotation	150	4	600	Increasing	Maintaining	Maintaining	Maintaining
11 3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
12 PCT/3Fert./CMAI	70	8	560	Strongly Increasing	Maintaining	Increasing	Maintaining
13 PCT/2CT	80	6	480	Maintaining	Maintaining	Strongly Decreasing	Maintaining
14 PCT/1CT/CMAI	80	6	460	Maintaining	Maintaining	Strongly Decreasing	Maintaining
15 PCT/1CT/3Fert./CMAI	70	8	660	Strongly Increasing	Maintaining	Increasing	Maintaining
16 PCT/2CT/3Fert./CMAI	70	8	560	Strongly Increasing	Maintaining	Increasing	Maintaining
17 Max Timber/D&E Debris Ret.	70	6	560	Strongly Increasing	Maintaining	Increasing	Maintaining
16 Max Timber @ 12" dbh	40	14	560	Maintaining	Maintaining	Maintaining	Maintaining
19 Max Timber @ 16" dbh	60	10	600	Strongly Increasing	Maintaining	Maintaining	Maintaining
20 Max Timber @ 20" dbh	100	6	600	Strongly Increasing	Maintaining	Increasing	Maintaining
21 Max Timber @ 24" dbh	160	3	540	Increasing	Maintaining	Increasing	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Maintaining	Maintaining	Increasing	Maintaining
23 20% Retention	300	2	600	Maintaining	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Alsea Rickreall Site Index 97

AR97 Case #	MODERATE BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1	No Treatment/High Stocking	90	6	540	Decreasing	Maintaining	Strongly Decreasing	Maintaining
2	No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Decreasing	Decreasing	Maintaining
3	PCT Only/CMAI	90	6	540	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
4	PCT Only/150 Year Rotation	150	4	500	Decreasing	Maintaining	Strongly Decreasing	Maintaining
5	PCT Only/200 Year Rotation	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
6	1Fert./CMAI	90	6	540	Decreasing	Maintaining	Decreasing	Maintaining
7	1Fert./150 Year Rotation	150	6	900	Maintaining	Maintaining	Decreasing	Maintaining
8	1Fert./200 Year Rotation	200	3	500	Maintaining	Maintaining	Decreasing	Maintaining
9	3Fert./CMAI	90	6	540	Maintaining	Maintaining	Maintaining	Maintaining
10	3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Maintaining
11	3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
12	PCT/3Fert./CMAI	90	5	540	Maintaining	Maintaining	Maintaining	Maintaining
13	PCT/2CT	90	6	540	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
14	PCT/1CT/CMAI	90	6	540	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
15	PCT/1CT/3Fert./CMAI	90	6	540	Maintaining	Maintaining	Maintaining	Maintaining
16	PCT/2CT/3Fert./CMAI	90	8	540	Maintaining	Maintaining	Maintaining	Maintaining
17	Max Timber/D&E Debris Ret.	90	6	540	Maintaining	Maintaining	Maintaining	Maintaining
18	Max Timber @ 12" dbh	50	12	600	Strongly Decreasing	Decreasing	Decreasing	Decreasing
19	Max Timber @ 16" dbh	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
20	Max Timber @ 20" dbh	130	4	520	Maintaining	Maintaining	Maintaining	Maintaining
21	Max Timber @ 24" dbh	240	3	720	Maintaining	Maintaining	Strongly Increasing	Maintaining
22	PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Maintaining	Increasing
23	20% Retention	300	2	600	Strongly Decreasing	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Alsea Rickreall Site Index 97

AR97 Case #	LIGHT BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1	No Treatment/High Stocking	90	6	540	Decreasing	Maintaining	Strongly Decreasing	Maintaining
2	No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Decreasing	Decreasing	Decreasing
3	PCT Only/CMAI	90	6	540	Decreasing	Maintaining	Strongly Decreasing	Maintaining
4	PCT Only/150 Year Rotation	150	4	600	Maintaining	Maintaining	Decreasing	Maintaining
5	PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
6	1Fert./CMAI	90	6	540	Maintaining	Maintaining	Decreasing	Maintaining
7	1Fert./150 Year Rotation	150	6	900	Maintaining	Maintaining	Maintaining	Maintaining
8	1Fert./200 Year Rotation	200	3	800	Maintaining	Maintaining	Maintaining	Maintaining
9	3Fert./CMAI	90	6	540	Maintaining	Maintaining	Increasing	Maintaining
10	3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Increasing	Maintaining
11	3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Increasing	Maintaining
12	PCT/3Fert./CMAI	70	6	420	Strongly Increasing	Maintaining	Increasing	Maintaining
13	PCT/2CT	90	6	540	Decreasing	Maintaining	Maintaining	Increasing
14	PCT/1CT/CMAI	90	8	540	Decreasing	Maintaining	Strongly Decreasing	Maintaining
15	PCT/1CT/3Fert./CMAI	90	6	540	Increasing	Maintaining	Increasing	Maintaining
16	PCT/2CT/3Fert./CMAI	90	6	540	Increasing	Maintaining	Increasing	Maintaining
17	Max Timber/D&E Debris Ret.	90	6	540	Increasing	Maintaining	Increasing	Maintaining
18	Max Timber @ 12" dbh	50	12	600	Decreasing	Decreasing	Maintaining	Maintaining
19	Max Timber @ 16" dbh	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
20	Max Timber @ 20" dbh	130	4	520	Increasing	Maintaining	Strongly Increasing	Maintaining
21	Max Timber @ 24" dbh	240	3	720	Maintaining	Maintaining	Strongly Increasing	Maintaining
22	PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Increasing	Strongly Increasing
23	20% Retention	300	2	600	Decreasing	Maintaining	Increasing	Maintaining

Long-Term Soil Productivity Site Trend

Alsea Rickreall Site Index 97

AR97 Case #	NO BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1	No Treatment/High Stocking	90	6	540	Maintaining	Maintaining	Decreasing	Maintaining
2	No Treatment/Low Stocking	100	6	600	Decreasing	Maintaining	Maintaining	Decreasing
3	PCT Only/CMAI	90	6	540	Maintaining	Maintaining	Maintaining	Maintaining
4	PCT Only/150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Increasing
5	PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Increasing
6	1Fert./CMAI	90	6	540	Maintaining	Maintaining	Maintaining	Maintaining
7	1Fert./150 Year Rotation	150	6	900	Maintaining	Maintaining	Maintaining	Maintaining
8	1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Increasing
9	3Fert./CMAI	90	6	540	Increasing	Maintaining	Strongly Increasing	Maintaining
10	3Fert./150 Year Rotation	150	4	500	Increasing	Maintaining	Strongly Increasing	Maintaining
11	3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Strongly Increasing	Increasing
12	PCT/3Fert./CMAI	90	5	540	Strongly Increasing	Maintaining	Strongly Increasing	Maintaining
13	PCT/2CT	90	8	540	Maintaining	Maintaining	Maintaining	Maintaining
14	PCT/1CT/CMAI	90	6	540	Maintaining	Maintaining	Maintaining	Maintaining
15	PCT/1CT/3Fert./CMAI	90	6	540	Strongly Increasing	Maintaining	Strongly Increasing	Maintaining
16	PCT/2CT/3Fert./CMAI	90	5	540	Strongly Increasing	Maintaining	Strongly Increasing	Maintaining
17	Max Timber/D&E Debris Ret.	90	6	540	Strongly Increasing	Maintaining	Strongly Increasing	Maintaining
18	Max Timber @ 12" dbh	50	12	600	Maintaining	Maintaining	Increasing	Maintaining
19	Max Timber @ 16" dbh	70	8	560	Strongly Increasing	Maintaining	Increasing	Maintaining
20	Max Timber @ 20" dbh	130	4	520	Strongly Increasing	Maintaining	Strongly Increasing	Increasing
21	Max Timber @ 24" dbh	240	3	720	Maintaining	Maintaining	Strongly Increasing	Maintaining
22	PCT/2CT/ @ 300Yrs.	300	2	600	Maintaining	Maintaining	Strongly Increasing	Increasing
23	20% Retention	300	2	600	Maintaining	Maintaining	Increasing	Maintaining

Long-Term Soil Productivity Site Trend

Clackamas M.U. Site Index 116

CL116 MODERATE BURN Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	80	6	480	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Decreasing	Strongly Decreasing	Decreasing
3 PCT Only/CMAI	80	6	480	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
4 PCT Only/150 Year Rotation	150	4	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
5 PCT Only/200 Year Rotation	200	3	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
6 1Fert./CMAI	80	6	480	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
7 1Fert./150 Year Rotation	150	6	900	Decreasing	Maintaining	Strongly Decreasing	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
9 3Fert./CMAI	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
10 3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Maintaining
11 3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
12 PCT/3Fert./CMAI	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
13 PCT/2CT	80	6	480	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
14 PCT/1CT/CMAI	80	6	480	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
15 PCT/1CT/3Fert./CMAI	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
16 PCT/2CT/3Fert./CMAI	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
17 Max Timber/D&E Debris Ret.	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
18 Max Timber @ 12" dbh	40	14	560	Strongly Decreasing	Strongly Decreasing	Decreasing	Decreasing
19 Max Timber @ 16" dbh	60	10	600	Decreasing	Decreasing	Decreasing	Maintaining
20 Max Timber @ 20" dbh	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
21 Max Timber @ 24" dbh	130	6	780	Maintaining	Maintaining	Maintaining	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Maintaining	Strongly Increasing
23 20% Retention	300	2	600	Strongly Decreasing	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Clackamas M.U. Site Index 116

CL116 LIGHT BURN Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	80	6	480	Decreasing	Maintaining	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Decreasing
3 PCT Only/CMAI	80	6	480	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
4 PCT Only/150 Year Rotation	150	4	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
5 PCT Only/200 Year Rotation	200	3	600	Decreasing	Maintaining	Decreasing	Increasing
6 1Fert./CMAI	80	6	480	Decreasing	Maintaining	Decreasing	Maintaining
7 1Fert./150 Year Rotation	150	6	900	Maintaining	Maintaining	Decreasing	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
9 3Fert./CMAI	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
10 3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Maintaining
11 3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
12 PCT/3Fert./CMAI	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
13 PCT/2CT	80	6	480	Decreasing	Maintaining	Strongly Decreasing	Maintaining
14 PCT/1CT/CMAI	80	6	480	Decreasing	Maintaining	Strongly Decreasing	Maintaining
15 PCT/1CT/3Fert./CMAI	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
16 PCT/2CT/3Fert./CMAI	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
17 Max Timber/D&E Debris Ret.	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
18 Max Timber @ 12" dbh	40	14	560	Strongly Decreasing	Decreasing	Maintaining	Decreasing
19 Max Timber @ 16" dbh	60	10	600	Maintaining	Maintaining	Maintaining	Maintaining
20 Max Timber @ 20" dbh	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
21 Max Timber @ 24" dbh	130	6	780	Maintaining	Maintaining	Maintaining	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Maintaining	Strongly Increasing
23 20% Retention	300	2	600	Strongly Decreasing	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Clackamas M.U. Site Index 116

CL116 NO BURN Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	80	6	480	Maintaining	Maintaining	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Maintaining	Decreasing	Maintaining
3 PCT Only/CMAI	80	6	480	Maintaining	Maintaining	Decreasing	Maintaining
4 PCT Only/150 Year Rotation	150	4	600	Maintaining	Maintaining	Decreasing	Maintaining
5 PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Decreasing	Maintaining
6 1Fert./CMAI	80	6	480	Maintaining	Maintaining	Decreasing	Maintaining
7 1Fert./150 Year Rotation	150	6	900	Maintaining	Maintaining	Maintaining	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
9 3Fert./CMAI	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
10 3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Maintaining
11 3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
12 PCT/3Fert./CMAI	80	6	480	Increasing	Maintaining	Maintaining	Maintaining
13 PCT/2CT	80	6	480	Maintaining	Maintaining	Strongly Decreasing	Maintaining
14 PCT/1CT/CMAI	80	6	480	Maintaining	Maintaining	Strongly Decreasing	Maintaining
15 PCT/1CT/3Fert./CMAI	80	6	480	Increasing	Maintaining	Maintaining	Maintaining
16 PCT/2CT/3Fert./CMAI	80	6	480	Increasing	Maintaining	Maintaining	Maintaining
17 Max Timber/D&E Debris Ret.	80	6	480	Increasing	Maintaining	Maintaining	Maintaining
18 Max Timber @ 12" dbh	40	14	560	Decreasing	Maintaining	Maintaining	Maintaining
19 Max Timber @ 16" dbh	60	10	600	Maintaining	Maintaining	Maintaining	Maintaining
20 Max Timber @ 20" dbh	80	6	480	Increasing	Maintaining	Maintaining	Maintaining
21 Max Timber @ 24" dbh	130	6	780	Increasing	Maintaining	Increasing	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Maintaining	Maintaining	Maintaining	Increasing
23 20% Retention	300	2	600	Decreasing	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Clackamas M.U. Site Index 91

CL91 Case #	MODERATE BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1	No Treatment/High Stocking	100	6	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
2	No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Decreasing	Decreasing	Maintaining
3	PCT Only/CMAI	100	6	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
4	PCT Only/150 Year Rotation	150	4	600	Strongly Decreasing	Maintaining	Decreasing	Maintaining
5	PCT Only/200 Year Rotation	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
6	1Fert./CMAI	100	6	600	Decreasing	Maintaining	Decreasing	Maintaining
7	1Fert./150 Year Rotation	150	6	900	Decreasing	Maintaining	Decreasing	Maintaining
8	1Fert./200 Year Rotation	200	3	600	Decreasing	Maintaining	Maintaining	Maintaining
9	3Fert./CMAI	100	6	600	Maintaining	Maintaining	Maintaining	Maintaining
10	3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Maintaining
11	3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Increasing	Maintaining
12	PCT/3Fert./CMAI	100	6	600	Maintaining	Maintaining	Maintaining	Maintaining
13	PCT/2CT	100	6	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
14	PCT/1CT/CMAI	100	6	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
15	PCT/1CT/3Fert./CMAI	100	6	600	Maintaining	Maintaining	Maintaining	Maintaining
16	PCT/2CT/3Fert./CMAI	100	6	600	Maintaining	Maintaining	Maintaining	Maintaining
17	Max Timber/D&E Debris Ret.	100	6	600	Maintaining	Maintaining	Increasing	Maintaining
18	Max Timber @ 12" dbh	60	12	600	Strongly Decreasing	Decreasing	Maintaining	Decreasing
19	Max Timber @ 16" dbh	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
20	Max Timber @ 20" dbh	150	4	600	Maintaining	Maintaining	Increasing	Maintaining
21	Max Timber @ 24" dbh	260	3	780	Maintaining	Maintaining	Strongly Increasing	Maintaining
22	PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Maintaining	Strongly Increasing
23	20% Retention	300	2	600	Strongly Decreasing	Maintaining	Strongly Increasing	Maintaining

Long-Term Soil Productivity Site Trend

Clackamas M.U. Site Index 91

CL91 Case #	LIGHT BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1	No Treatment/High Stocking	100	6	500	Decreasing	Maintaining	Strongly Decreasing	Maintaining
2	No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Decreasing	Maintaining	Decreasing
3	PCT Only/CMAI	100	6	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
4	PCT Only/150 Year Rotation	150	4	600	Decreasing	Maintaining	Decreasing	Maintaining
5	PCT Only/200 Year Rotation	200	3	600	Decreasing	Maintaining	Maintaining	Increasing
6	1Fert./CMAI	100	6	600	Decreasing	Maintaining	Maintaining	Maintaining
7	1Fert./150 Year Rotation	150	6	900	Maintaining	Maintaining	Maintaining	Maintaining
8	1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
9	3Fert./CMAI	100	6	600	Maintaining	Maintaining	Increasing	Maintaining
10	3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Strongly Increasing	Maintaining
11	3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Strongly Increasing	Maintaining
12	PCT/3Fert./CMAI	100	6	600	Increasing	Maintaining	Strongly Increasing	Maintaining
13	PCT/2CT	100	6	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
14	PCT/1CT/CMAI	100	6	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
15	PCT/1CT/3Fert./CMAI	100	6	600	Increasing	Maintaining	Strongly Increasing	Maintaining
16	PCT/2CT/3Fert./CMAI	100	6	600	Increasing	Maintaining	Strongly Increasing	Maintaining
17	Max Timber/D&E Debris Ret.	100	6	600	Increasing	Maintaining	Strongly Increasing	Maintaining
18	Max Timber @ 12" dbh	50	12	600	Decreasing	Decreasing	Maintaining	Maintaining
19	Max Timber @ 16" dbh	80	6	480	Maintaining	Maintaining	Maintaining	Maintaining
20	Max Timber @ 20" dbh	150	4	600	Maintaining	Maintaining	Strongly Increasing	Maintaining
21	Max Timber @ 24" dbh	260	3	780	Maintaining	Maintaining	Strongly Increasing	Maintaining
22	PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Strongly Increasing	Strongly Increasing
23	20% Retention	300	2	600	Decreasing	Maintaining	Strongly Increasing	Maintaining

Long-Term Soil Productivity Site Trend

Clackamas M.U. Site Index 91

CL91 Case #	NO BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1	No Treatment/High Stocking	100	6	600	Maintaining	Maintaining	Maintaining	Maintaining
2	No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Maintaining	Maintaining	Maintaining
3	PCT Only/CMAI	100	6	600	Maintaining	Maintaining	Maintaining	Maintaining
4	PCT Only/150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Increasing
5	PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Increasing	Increasing
6	1Fert./CMAI	100	6	600	Maintaining	Maintaining	Maintaining	Maintaining
7	1Fert./150 Year Rotation	150	6	900	Maintaining	Maintaining	Increasing	Maintaining
8	1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Increasing	Maintaining
9	3Fert./CMAI	100	6	600	Maintaining	Maintaining	Strongly Increasing	Maintaining
10	3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Strongly Increasing	Increasing
11	3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Strongly Increasing	Increasing
12	PCT/3Fert./CMAI	100	6	600	Increasing	Maintaining	Strongly Increasing	Maintaining
13	PCT/2CT	100	6	600	Maintaining	Maintaining	Maintaining	Maintaining
14	PCT/1CT/CMAI	100	6	600	Maintaining	Maintaining	Maintaining	Maintaining
15	PCT/1CT/3Fert./CMAI	100	6	600	Strongly Increasing	Maintaining	Strongly Increasing	Maintaining
16	PCT/2CT/3Fert./CMAI	100	6	600	Strongly Increasing	Maintaining	Strongly Increasing	Maintaining
17	Max Timber/D&E Debris Ret.	100	6	600	Increasing	Maintaining	Strongly Increasing	Maintaining
18	Max Timber @ 12" dbh	60	12	600	Maintaining	Maintaining	Increasing	Maintaining
19	Max Timber @ 16" dbh	80	6	480	Increasing	Maintaining	Strongly Increasing	Maintaining
20	Max Timber @ 20" dbh	150	4	600	Increasing	Maintaining	Strongly Increasing	Maintaining
21	Max Timber @ 24" dbh	260	3	780	Maintaining	Maintaining	Strongly Increasing	Maintaining
22	PCT/2CT/ @ 300Yrs.	300	2	600	Maintaining	Maintaining	Strongly Increasing	Strongly Increasing
23	20% Retention	300	2	600	Decreasing	Maintaining	Strongly Increasing	Maintaining

Long-Term Soil Productivity Site Trend

Columbia M.U. Site Index 120

CO120 MODERATE BURN

Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	70	8	550	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	5	600	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
3 PCT Only/CMAI	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
4 PCT Only/150 Year Rotation	150	4	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
5 PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
6 1Fert./CMAI	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
7 1Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
9 3Fert./CMAI	70	8	550	Maintaining	Maintaining	Maintaining	Maintaining
10 3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Decreasing	Maintaining
11 3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Decreasing	Maintaining
12 PCT/3Fert./CMAI	60	10	600	Increasing	Maintaining	Maintaining	Maintaining
13 PCT/2CT	70	8	550	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
14 PCT/1CT/CMAI	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
15 PCT/1CT/3Fert./CMAI	70	8	560	Increasing	Maintaining	Maintaining	Maintaining
16 PCT/2CT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
17 Max Timber/D&E Debris Ret.	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
18 Max Timber @ 12" dbh	40	14	550	Strongly Decreasing	Strongly Decreasing	Strongly Decreasing	Maintaining
19 Max Timber @ 16" dbh	70	8	560	Maintaining	Maintaining	Strongly Decreasing	Maintaining
20 Max Timber @ 20" dbh	130	4	520	Increasing	Maintaining	Decreasing	Maintaining
21 Max Timber @ 24" dbh	220	3	660	Maintaining	Maintaining	Decreasing	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Maintaining	Maintaining	Decreasing	Maintaining
23 20% Retention	300	2	600	Decreasing	Maintaining	Decreasing	Maintaining

Long-Term Soil Productivity Site Trend

Columbia M.U. Site Index 120

CO120 LIGHT BURN

Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	70	8	560	Decreasing	Maintaining	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Decreasing	Strongly Decreasing	Decreasing
3 PCT Only/CMAI	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
4 PCT Only/150 Year Rotation	150	4	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
5 PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
6 1Fert./CMAI	70	8	560	Decreasing	Maintaining	Strongly Decreasing	Maintaining
7 1Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
9 3Fert./CMAI	70	8	550	Maintaining	Maintaining	Maintaining	Maintaining
10 3Fert./150 Year Rotation	150	4	600	Increasing	Maintaining	Decreasing	Maintaining
11 3Fert./200 Year Rotation	200	3	600	Increasing	Maintaining	Decreasing	Increasing
12 PCT/3Fert./CMAI	60	10	600	Strongly Increasing	Maintaining	Increasing	Maintaining
13 PCT/2CT	70	7	560	Strongly Decreasing	Strongly Decreasing	Strongly Decreasing	Maintaining
14 PCT/1CT/CMAI	70	8	560	Decreasing	Decreasing	Strongly Decreasing	Maintaining
15 PCT/1CT/3Fert./CMAI	70	8	560	Strongly Increasing	Maintaining	Maintaining	Maintaining
16 PCT/2CT/3Fert./CMAI	70	7	550	Maintaining	Strongly Decreasing	Increasing	Maintaining
17 Max Timber/D&E Debris Ret.	70	8	560	Strongly Increasing	Maintaining	Increasing	Maintaining
18 Max Timber @ 12" dbh	40	14	560	Strongly Decreasing	Decreasing	Decreasing	Decreasing
19 Max Timber @ 16" dbh	70	8	560	Maintaining	Maintaining	Decreasing	Maintaining
20 Max Timber @ 20" dbh	130	4	520	Increasing	Maintaining	Maintaining	Maintaining
21 Max Timber @ 24" dbh	220	3	660	Increasing	Maintaining	Decreasing	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Maintaining	Maintaining	Decreasing	Maintaining
23 20% Retention	300	2	600	Maintaining	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Columbia M.U. Site Index 120

CO120 NO BURN

Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	70	8	560	Maintaining	Maintaining	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	5	500	Decreasing	Strongly Decreasing	Maintaining	Maintaining
3 PCT Only/CMAI	70	8	560	Maintaining	Maintaining	Strongly Decreasing	Maintaining
4 PCT Only/150 Year Rotation	150	4	600	Maintaining	Maintaining	Strongly Decreasing	Maintaining
5 PCT Only/200 Year Rotation	200	3	500	Maintaining	Maintaining	Decreasing	Maintaining
6 1Fert./CMAI	70	8	560	Increasing	Maintaining	Maintaining	Maintaining
7 1Fert./150 Year Rotation	150	4	600	Increasing	Maintaining	Decreasing	Maintaining
8 1Fert./200 Year Rotation	200	2	400	Maintaining	Strongly Decreasing	Decreasing	Maintaining
9 3Fert./CMAI	70	8	560	Increasing	Maintaining	Maintaining	Maintaining
10 3Fert./150 Year Rotation	150	4	600	Strongly Increasing	Maintaining	Maintaining	Increasing
11 3Fert./200 Year Rotation	200	2	400	Increasing	Strongly Decreasing	Maintaining	Increasing
12 PCT/3Fert./CMAI	60	10	600	Strongly Increasing	Maintaining	Increasing	Maintaining
13 PCT/2CT	70	8	560	Maintaining	Maintaining	Strongly Decreasing	Maintaining
14 PCT/1CT/CMAI	70	8	560	Maintaining	Maintaining	Strongly Decreasing	Maintaining
15 PCT/1CT/3Fert./CMAI	70	8	580	Strongly Increasing	Maintaining	Increasing	Maintaining
16 PCT/2CT/3Fert./CMAI	70	8	560	Strongly Increasing	Maintaining	Increasing	Maintaining
17 Max Timber/D&E Debris Ret.	70	8	580	Strongly Increasing	Maintaining	Increasing	Maintaining
18 Max Timber @ 12" dbh	40	14	560	Maintaining	Maintaining	Maintaining	Maintaining
19 Max Timber @ 16" dbh	70	7	490	Strongly Increasing	Strongly Decreasing	Maintaining	Maintaining
20 Max Timber @ 20" dbh	130	4	520	Strongly Increasing	Maintaining	Maintaining	Maintaining
21 Max Timber @ 24" dbh	220	3	660	Increasing	Maintaining	Maintaining	Increasing
22 PCT/2CT/ @ 300Yrs.	300	2	600	Maintaining	Maintaining	Maintaining	Maintaining
23 20% Retention	300	2	600	Maintaining	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Santiam M.U. Site Index 120

SA120 Case #	MODERATE BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.D./ Average Site Quality
1	No Treatment/High Stocking	70	8	660	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
2	No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
3	PCT Only/CMAI	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
4	PCT Only/150 Year Rotation	150	4	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
5	PCT Only/200 Year Rotation	200	3	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
6	1Fert./CMAI	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
7	1Fert./150 Year Rotation	150	6	900	Decreasing	Maintaining	Strongly Decreasing	Maintaining
8	1Fert./200 Year Rotation	200	3	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
9	3Fert./CMAI	70	8	560	Decreasing	Maintaining	Maintaining	Maintaining
10	3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Decreasing	Maintaining
11	3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
12	PCT/3Fert./CMAI	60	10	600	Maintaining	Maintaining	Maintaining	Maintaining
13	PCT/2CT	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
14	PCT/1CT/CMAI	70	8	660	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
15	PCT/1CT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
16	PCT/2CT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
17	Max Timber/D&E Debris Ret.	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
18	Max Timber @ 12" dbh	40	14	560	Strongly Decreasing	Strongly Decreasing	Strongly Decreasing	Decreasing
19	Max Timber @ 16" dbh	70	8	560	Decreasing	Maintaining	Decreasing	Maintaining
20	Max Timber @ 20" dbh	130	4	520	Maintaining	Maintaining	Maintaining	Maintaining
21	Max Timber @ 24" dbh	220	3	660	Maintaining	Maintaining	Maintaining	Maintaining
22	PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Maintaining	Strongly Increasing
23	20% Retention	300	2	600	Strongly Decreasing	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Santiam M.U. Site Index 120

SA120 Case #	LIGHT BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.D./ Average Site Quality
1	No Treatment/High Stocking	70	8	560	Decreasing	Maintaining	Strongly Decreasing	Maintaining
2	No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Decreasing
3	PCT Only/CMAI	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
4	PCT Only/160 Year Rotation	150	4	800	Decreasing	Maintaining	Strongly Decreasing	Maintaining
5	PCT Only/200 Year Rotation	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
6	1Fert./CMAI	70	8	660	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
7	1Fert./150 Year Rotation	150	6	900	Decreasing	Maintaining	Decreasing	Maintaining
8	1Fert./200 Year Rotation	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
9	3Fert./CMAI	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
10	3Fert./150 Year Rotation	160	4	600	Maintaining	Maintaining	Maintaining	Maintaining
11	3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
12	PCT/3Fert./CMAI	60	10	600	Maintaining	Maintaining	Increasing	Maintaining
13	PCT/2CT	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Decreasing
14	PCT/1CT/CMAI	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
15	PCT/1CT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Increasing	Maintaining
16	PCT/2CT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Increasing	Maintaining
17	Max Timber/D&E Debris Ret.	70	8	560	Maintaining	Maintaining	Increasing	Maintaining
18	Max Timber @ 12" dbh	40	14	560	Strongly Decreasing	Decreasing	Decreasing	Decreasing
19	Max Timber @ 16" dbh	70	8	560	Maintaining	Maintaining	Decreasing	Maintaining
20	Max Timber @ 20" dbh	130	4	520	Maintaining	Maintaining	Maintaining	Maintaining
21	Max Timber @ 24" dbh	220	3	660	Maintaining	Maintaining	Maintaining	Maintaining
22	PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Maintaining	Increasing
23	20% Retention	300	2	600	Strongly Decreasing	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Santiam M.U. Site Index 120

SA120 Case #	NO BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.D./ Average Site Quality
1	No Treatment/High Stocking	70	8	560	Maintaining	Maintaining	Decreasing	Maintaining
2	No Treatment/Low Stocking	100	8	600	Strongly Decreasing	Maintaining	Decreasing	Maintaining
3	PCT Only/CMAI	70	8	560	Maintaining	Maintaining	Decreasing	Maintaining
4	PCT Only/160 Year Rotation	160	4	600	Maintaining	Maintaining	Maintaining	Increasing
5	PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
6	1Fert./CMAI	70	8	560	Decreasing	Maintaining	Decreasing	Maintaining
7	1Fert./150 Year Rotation	160	6	900	Maintaining	Maintaining	Maintaining	Increasing
8	1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
9	3Fert./CMAI	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
10	3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Maintaining
11	3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Increasing	Maintaining
12	PCT/3Fert./CMAI	60	10	600	Maintaining	Maintaining	Increasing	Maintaining
13	PCT/2CT	70	8	560	Maintaining	Maintaining	Decreasing	Maintaining
14	PCT/1CT/CMAI	70	8	560	Maintaining	Maintaining	Decreasing	Maintaining
15	PCT/1CT/3Fert./CMAI	70	8	660	Increasing	Maintaining	Increasing	Maintaining
16	PCT/2CT/3Fert./CMAI	70	8	660	Increasing	Maintaining	Increasing	Maintaining
17	Max Timber/D&E Debris Ret.	70	8	660	Increasing	Maintaining	Increasing	Maintaining
18	Max Timber @ 12" dbh	40	14	560	Strongly Decreasing	Maintaining	Maintaining	Maintaining
19	Max Timber @ 16" dbh	70	8	560	Increasing	Maintaining	Maintaining	Maintaining
20	Max Timber @ 20" dbh	130	4	520	Maintaining	Maintaining	Increasing	Maintaining
21	Max Timber @ 24" dbh	220	3	680	Maintaining	Maintaining	Increasing	Maintaining
22	PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Increasing	Maintaining
23	20% Retention	300	2	600	Decreasing	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Santiam M.U. Site Index 120

SA93 Case # MODERATE BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Decreasing	Decreasing	Decreasing
3 PCT Only/CMAI	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
4 PCT Only/150 Year Rotation	150	4	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
5 PCT Only/200 Year Rotation	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
6 1Fert./CMAI	70	8	560	Strongly Decreasing	Decreasing	Decreasing	Decreasing
7 1Fert./150 Year Rotation	150	6	900	Decreasing	Maintaining	Decreasing	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Decreasing	Maintaining	Maintaining	Maintaining
9 3Fert./CMAI	70	8	560	Decreasing	Decreasing	Increasing	Maintaining
10 3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Maintaining
11 3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Increasing	Maintaining
12 PCT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
13 PCT/2CT	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
14 PCT/1CT/CMAI	70	8	560	Strongly Decreasing	Decreasing	Strongly Decreasing	Maintaining
15 PCT/1CT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
16 PCT/2CT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
17 Max Timber/D&E Debris Ret.	70	8	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
18 Max Timber @ 12" dbh	50	12	600	Strongly Decreasing	Decreasing	Maintaining	Decreasing
19 Max Timber @ 16" dbh	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
20 Max Timber @ 20" dbh	140	4	560	Maintaining	Maintaining	Increasing	Maintaining
21 Max Timber @ 24" dbh	230	3	690	Maintaining	Maintaining	Strongly Increasing	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Maintaining	Strongly Increasing
23 20% Retention	300	2	600	Strongly Decreasing	Maintaining	Increasing	Maintaining

Long-Term Soil Productivity Site Trend

Santiam M.U. Site Index 120

SA93 Case # LIGHT BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	70	8	560	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
2 No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Decreasing	Maintaining	Decreasing
3 PCT Only/CMAI	70	8	560	Strongly Decreasing	Maintaining	Decreasing	Maintaining
4 PCT Only/150 Year Rotation	150	4	600	Decreasing	Maintaining	Decreasing	Maintaining
5 PCT Only/200 Year Rotation	200	3	600	Decreasing	Maintaining	Maintaining	Maintaining
6 1Fert./CMAI	70	8	560	Decreasing	Maintaining	Maintaining	Maintaining
7 1Fert./150 Year Rotation	150	6	900	Maintaining	Maintaining	Maintaining	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Maintaining	Maintaining
9 3Fert./CMAI	70	8	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
10 3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Increasing	Maintaining
11 3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Strongly Increasing	Maintaining
12 PCT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
13 PCT/2CT	70	8	560	Strongly Decreasing	Maintaining	Decreasing	Maintaining
14 PCT/1CT/CMAI	70	8	560	Strongly Decreasing	Maintaining	Decreasing	Maintaining
15 PCT/1CT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
16 PCT/2CT/3Fert./CMAI	70	8	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
17 Max Timber/D&E Debris Ret.	70	8	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
18 Max Timber @ 12" dbh	50	12	600	Decreasing	Decreasing	Maintaining	Maintaining
19 Max Timber @ 16" dbh	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
20 Max Timber @ 20" dbh	140	4	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
21 Max Timber @ 24" dbh	230	3	690	Maintaining	Maintaining	Strongly Increasing	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Decreasing	Maintaining	Strongly Increasing	Strongly Increasing
23 20% Retention	300	2	600	Decreasing	Maintaining	Strongly Increasing	Maintaining

Long-Term Soil Productivity Site Trend

Santiam M.U. Site Index 120

SA93 Case # NO BURN	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 No Treatment/High Stocking	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
2 No Treatment/Low Stocking	100	6	600	Strongly Decreasing	Maintaining	Maintaining	Maintaining
3 PCT Only/CMAI	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
4 PCT Only/150 Year Rotation	150	4	600	Maintaining	Maintaining	Maintaining	Increasing
5 PCT Only/200 Year Rotation	200	3	600	Maintaining	Maintaining	Increasing	Increasing
6 1Fert./CMAI	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
7 1Fert./150 Year Rotation	150	6	900	Maintaining	Maintaining	Increasing	Maintaining
8 1Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Increasing	Maintaining
9 3Fert./CMAI	70	8	560	Maintaining	Maintaining	Strongly Increasing	Maintaining
10 3Fert./150 Year Rotation	150	4	600	Maintaining	Maintaining	Strongly Increasing	Maintaining
11 3Fert./200 Year Rotation	200	3	600	Maintaining	Maintaining	Strongly Increasing	Increasing
12 PCT/3Fert./CMAI	70	8	560	Increasing	Maintaining	Strongly Increasing	Maintaining
13 PCT/2CT	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
14 PCT/1CT/CMAI	70	8	560	Maintaining	Maintaining	Maintaining	Maintaining
15 PCT/1CT/3Fert./CMAI	70	8	560	Increasing	Maintaining	Strongly Increasing	Maintaining
16 PCT/2CT/3Fert./CMAI	70	8	560	Increasing	Maintaining	Strongly Increasing	Maintaining
17 Max Timber/D&E Debris Ret.	70	8	560	Increasing	Maintaining	Strongly Increasing	Maintaining
18 Max Timber @ 12" dbh	50	12	600	Maintaining	Maintaining	Increasing	Maintaining
19 Max Timber @ 16" dbh	70	8	560	Increasing	Maintaining	Strongly Increasing	Maintaining
20 Max Timber @ 20" dbh	140	4	560	Increasing	Maintaining	Strongly Increasing	Maintaining
21 Max Timber @ 24" dbh	230	3	690	Maintaining	Maintaining	Strongly Increasing	Maintaining
22 PCT/2CT/ @ 300Yrs.	300	2	600	Maintaining	Maintaining	Strongly Increasing	Increasing
23 20% Retention	300	2	600	Decreasing	Maintaining	Strongly Increasing	Maintaining

Long-Term Soil Productivity Site Trend

Alsea Rickreall M.U. Site Index 123

AR123 Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 General Forest W/CT Lt. Burn	80	8	640	Maintaining	Maintaining	Maintaining	Maintaining
2 General Forest W/CT No Burn	80	8	640	Maintaining	Maintaining	Increasing	Maintaining
3 General Forest W/CT Mod. Burn	80	8	640	Maintaining	Maintaining	Maintaining	Maintaining
4 General Forest W/Lt. Burn	80	8	640	Maintaining	Maintaining	Maintaining	Maintaining
5 General Forest W/No Burn	80	8	640	Maintaining	Maintaining	Maintaining	Maintaining
6 General Forest W/Mod. Burn	80	8	640	Maintaining	Maintaining	Decreasing	Increasing
7 Connectivity W/CT Lt. Burn	150	6	900	Maintaining	Maintaining	Decreasing	Maintaining
8 Connectivity W/CT No Burn	150	6	900	Maintaining	Maintaining	Decreasing	Maintaining
9 Connectivity W/CT Mod. Burn	150	6	900	Maintaining	Maintaining	Strongly Decreasing	Maintaining
10 Connectivity W/Lt. Burn	150	6	900	Maintaining	Maintaining	Decreasing	Increasing
11 Connectivity W/No Burn	150	6	900	Maintaining	Maintaining	Decreasing	Increasing
12 Connectivity W/Mod. Burn	150	6	900	Maintaining	Maintaining	Strongly Decreasing	Maintaining
13 OGA-1 W/CT Lt. Burn	300	3	900	Maintaining	Maintaining	Maintaining	Maintaining
14 OGA-1 W/CT No Burn	300	3	900	Maintaining	Maintaining	Maintaining	Increasing
15 OGA-1 W/CT Mod. Burn	300	3	900	Maintaining	Maintaining	Decreasing	Maintaining
16 OGA-1 W/Lt. Burn	300	3	900	Maintaining	Maintaining	Maintaining	Increasing
17 OGA-1 W/No Burn	300	3	900	Maintaining	Maintaining	Maintaining	Maintaining
18 OGA-1 W/Mod. Burn	300	3	900	Maintaining	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Alsea Rickreall M.U. Site Index 97

AR97 Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 OGA-1 W/CT Lt. Burn	300	3	900	Maintaining	Maintaining	Strongly Increasing	Increasing
2 OGA-1 W/CT No Burn	300	3	900	Maintaining	Maintaining	Strongly Increasing	Maintaining
3 OGA-1 W/CT Mod. Burn	300	3	900	Decreasing	Maintaining	Increasing	Maintaining
4 OGA-1 W/Lt. Burn	300	3	900	Maintaining	Maintaining	Strongly Increasing	Increasing
5 OGA-1 W/No Burn	300	3	900	Maintaining	Maintaining	Strongly Increasing	Maintaining
6 OGA-1 W/Mod. Burn	300	3	900	Decreasing	Maintaining	Increasing	Maintaining

Long-Term Soil Productivity Site Trend

Clackamas M.U. Site Index 116

CL116 Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 General Forest W/CT Lt. Burn	80	10	800	Maintaining	Maintaining	Maintaining	Maintaining
2 General Forest W/CT No Burn	80	10	800	Increasing	Maintaining	Maintaining	Maintaining
3 General Forest W/CT Mod. Burn	80	10	800	Maintaining	Maintaining	Maintaining	Maintaining
4 General Forest W/Lt. Burn	80	10	800	Maintaining	Maintaining	Maintaining	Maintaining
5 General Forest W/No Burn	80	10	800	Maintaining	Maintaining	Increasing	Maintaining
6 General Forest W/Mod. Burn	80	10	800	Maintaining	Maintaining	Maintaining	Maintaining
7 Connectivity-2 W/CT Lt. Burn	150	6	900	Decreasing	Maintaining	Strongly Decreasing	Increasing
8 Connectivity-2 W/CT No Burn	150	6	900	Maintaining	Maintaining	Decreasing	Increasing
9 Connectivity-2 W/CT Mod. Burn	150	6	900	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
10 Connectivity-2 W/Lt. Burn	150	4	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
11 Connectivity-2 W/No Burn	150	4	600	Maintaining	Maintaining	Decreasing	Maintaining
12 Connectivity-2 W/Mod. Burn	150	4	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
13 Connectivity-3 W/CT Lt. Burn	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
14 Connectivity-3 W/CT No Burn	200	3	600	Decreasing	Maintaining	Maintaining	Maintaining
15 Connectivity-3 W/CT Mod. Burn	200	3	600	Strongly Decreasing	Maintaining	Decreasing	Maintaining
16 Connectivity-3 W/Lt. Burn	200	3	800	Decreasing	Maintaining	Maintaining	Maintaining
17 Connectivity-3 W/No Burn	200	3	800	Decreasing	Maintaining	Maintaining	Maintaining
18 Connectivity-3 W/Mod. Burn	200	3	600	Strongly Decreasing	Maintaining	Decreasing	Maintaining
19 OGA-1 W/CT Lt. Burn	300	3	900	Decreasing	Maintaining	Maintaining	Increasing
20 OGA-1 W/CT No Burn	300	3	900	Maintaining	Maintaining	Maintaining	Maintaining
21 OGA-1 W/CT Mod. Burn	300	3	900	Decreasing	Maintaining	Maintaining	Maintaining
22 OGA-1 W/Lt. Burn	300	3	900	Decreasing	Maintaining	Maintaining	Increasing
23 OGA-1 W/No Burn	300	3	900	Maintaining	Maintaining	Maintaining	Maintaining
24 OGA-1 W/Mod. Burn	300	3	900	Strongly Decreasing	Maintaining	Maintaining	Maintaining

Long-Term Soil Productivity Site Trend

Clackamas M.U. Site Index 91

CL91 Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 General Forest W/CT Lt. Burn	100	8	800	Maintaining	Maintaining	Strongly Increasing	Maintaining
2 General Forest W/CT No Burn	100	8	800	Increasing	Maintaining	Strongly Increasing	Maintaining
3 General Forest W/CT Mod. Burn	100	8	800	Maintaining	Maintaining	Increasing	Increasing
4 General Forest W/Lt. Burn	100	8	800	Maintaining	Maintaining	Strongly Increasing	Maintaining
5 General Forest W/No Burn	100	8	800	Increasing	Maintaining	Strongly Increasing	Maintaining
6 General Forest W/Mod. Burn	100	8	800	Maintaining	Maintaining	Increasing	Increasing
7 OGA-1 W/CT Lt. Burn	300	3	900	Decreasing	Maintaining	Strongly Increasing	Increasing
8 OGA-1 W/CT No Burn	300	3	900	Maintaining	Maintaining	Strongly Increasing	Maintaining
9 OGA-1 W/CT Mod. Burn	300	3	900	Decreasing	Maintaining	Strongly Increasing	Maintaining
10 OGA-1 W/Lt. Burn	300	3	900	Decreasing	Maintaining	Strongly Increasing	Increasing
11 OGA-1 W/No Burn	300	3	900	Maintaining	Maintaining	Strongly Increasing	Maintaining
12 OGA-1 W/Mod. Burn	300	3	900	Decreasing	Maintaining	Strongly Increasing	Maintaining

Long-Term Soil Productivity Site Trend

Columbia M.U. Site Index 120

CO120 Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 General Forest W/CT Lt. Burn	70	12	840	Strongly Increasing	Strongly Decreasing	Increasing	Maintaining
2 General Forest W/CT No Burn	70	12	840	Strongly Increasing	Strongly Decreasing	Increasing	Maintaining
3 General Forest W/CT Mod. Burn	70	12	840	Strongly Increasing	Strongly Decreasing	Increasing	Maintaining
4 General Forest W/Lt. Burn	70	12	840	Strongly Increasing	Maintaining	Increasing	Maintaining
5 General Forest W/No Burn	70	12	840	Strongly Increasing	Strongly Decreasing	Increasing	Maintaining
6 General Forest W/Mod. Burn	70	12	840	Strongly Increasing	Strongly Decreasing	Increasing	Maintaining
7 Connectivity W/CT Lt. Burn	150	6	900	Maintaining	Maintaining	Strongly Decreasing	Maintaining
8 Connectivity W/CT No Burn	150	6	900	Maintaining	Maintaining	Decreasing	Increasing
9 Connectivity W/CT Mod. Burn	150	6	900	Decreasing	Maintaining	Strongly Decreasing	Maintaining
10 Connectivity W/Lt. Burn	150	6	900	Maintaining	Maintaining	Strongly Decreasing	Maintaining
11 Connectivity W/No Burn	150	6	900	Maintaining	Maintaining	Strongly Decreasing	Maintaining
12 Connectivity W/Mod. Burn	150	6	900	Decreasing	Maintaining	Strongly Decreasing	Maintaining
13 OGA-1 W/CT Lt. Burn	300	3	900	Maintaining	Maintaining	Increasing	Maintaining
14 OGA-1 W/CT No Burn	300	3	900	Maintaining	Maintaining	Increasing	Maintaining
15 OGA-1 W/CT Mod. Burn	300	3	900	Maintaining	Maintaining	Maintaining	Maintaining
16 OGA-1 W/Lt. Burn	300	3	900	Maintaining	Maintaining	Maintaining	Maintaining
17 OGA-1 W/No Burn	300	3	900	Maintaining	Maintaining	Maintaining	Maintaining
18 OGA-1 W/Mod. Burn	300	3	900	Maintaining	Maintaining	Maintaining	Maintaining
19 OGA-2 W/CT Lt. Burn	150	6	900	Maintaining	Maintaining	Decreasing	Increasing
20 OGA-2 W/CT No Burn	150	6	900	Maintaining	Maintaining	Decreasing	Increasing
21 OGA-2 W/CT Mod. Burn	150	6	900	Decreasing	Maintaining	Strongly Decreasing	Maintaining
22 OGA-2 W/Lt. Burn	150	6	900	Maintaining	Maintaining	Strongly Decreasing	Increasing
23 OGA-2 W/No Burn	150	6	900	Maintaining	Maintaining	Decreasing	Increasing
24 OGA-2 W/Mod. Burn	150	6	900	Decreasing	Maintaining	Strongly Decreasing	Maintaining

Long-Term Soil Productivity Site Trend

Santiam M.U. Site Index 120

SA120 Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 General Forest W/CT Lt. Burn	70	12	840	Maintaining	Maintaining	Maintaining	Maintaining
2 General Forest W/CT No Burn	70	12	840	Maintaining	Maintaining	Maintaining	Maintaining
3 General Forest W/CT Mod. Burn	70	12	840	Maintaining	Maintaining	Maintaining	Maintaining
4 General Forest W/Lt. Burn	70	12	840	Maintaining	Maintaining	Maintaining	Maintaining
5 General Forest W/No Burn	70	12	840	Maintaining	Maintaining	Increasing	Maintaining
6 General Forest W/Mod. Burn	70	12	840	Maintaining	Maintaining	Maintaining	Maintaining
7 Connectivity W/CT Lt. Burn	150	4	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
8 Connectivity W/CT No Burn	150	4	600	Decreasing	Maintaining	Decreasing	Maintaining
9 Connectivity W/CT Mod. Burn	150	3	450	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
10 Connectivity W/Lt. Burn	150	4	600	Decreasing	Maintaining	Strongly Decreasing	Maintaining
11 Connectivity W/No Burn	150	4	600	Decreasing	Maintaining	Decreasing	Increasing
12 Connectivity W/Mod. Burn	150	4	600	Strongly Decreasing	Maintaining	Strongly Decreasing	Maintaining
13 OGA-1 W/CT Lt. Burn	300	3	900	Decreasing	Maintaining	Increasing	Maintaining
14 OGA-1 W/CT No Burn	300	3	900	Decreasing	Maintaining	Increasing	Maintaining
15 OGA-1 W/CT Mod. Burn	300	3	900	Decreasing	Maintaining	Maintaining	Maintaining
16 OGA-1 W/Lt. Burn	300	3	900	Decreasing	Maintaining	Maintaining	Increasing
17 OGA-1 W/No Burn	300	3	900	Decreasing	Maintaining	Increasing	Maintaining
18 OGA-1 W/Mod. Burn	300	3	900	Decreasing	Maintaining	Maintaining	Maintaining
19 OGA-3 W/CT Lt. Burn	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
20 OGA-3 W/CT No Burn	200	3	600	Decreasing	Maintaining	Decreasing	Increasing
21 OGA-3 W/CT Mod. Burn	200	3	600	Strongly Decreasing	Maintaining	Decreasing	Maintaining
22 OGA-3 W/Lt. Burn	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
23 OGA-3 W/No Burn	200	3	600	Decreasing	Maintaining	Decreasing	Maintaining
24 OGA-3 W/Mod. Burn	200	3	600	Strongly Decreasing	Maintaining	Decreasing	Maintaining

Long-Term Soil Productivity Site Trend

Santiam M.U. Site Index 93

SA93 Case #	Rotation Length	Number of Rotations	Evaluation Timeframe Years	Productivity Trend Mean Annual Production /Baseline	Last Rotation/ Mean Annual Production	Site Quality Trend Average Site Quality/Baseline	Last Rotation S.Q./ Average Site Quality
1 OGA-1 W/CT Lt. Burn	300	3	900	Maintaining	Maintaining	Strongly Increasing	Maintaining
2 OGA-1 W/CT No Burn	300	3	900	Maintaining	Maintaining	Strongly Increasing	Maintaining
3 OGA-1 W/CT Mod. Burn	300	3	900	Decreasing	Maintaining	Strongly Increasing	Maintaining
4 OGA-1 W/Lt. Burn	300	3	900	Maintaining	Maintaining	Strongly Increasing	Maintaining
5 OGA-1 W/No Burn	300	3	900	Maintaining	Maintaining	Strongly Increasing	Maintaining
6 OGA-1 W/Mod. Burn	300	3	900	Decreasing	Maintaining	Strongly Increasing	Increasing
7 OGA-3 W/CT Lt. Burn	200	4	800	Decreasing	Maintaining	Increasing	Maintaining
8 OGA-3 W/CT No Burn	200	4	800	Maintaining	Maintaining	Increasing	Maintaining
9 OGA-3 W/CT Mod. Burn	200	4	800	Decreasing	Maintaining	Maintaining	Maintaining
10 OGA-3 W/Lt. Burn	200	4	800	Decreasing	Maintaining	Maintaining	Maintaining
11 OGA-3 W/No Burn	200	4	800	Maintaining	Maintaining	Increasing	Maintaining
12 OGA-3 W/Mod. Burn	200	4	800	Decreasing	Maintaining	Maintaining	Maintaining

Watershed Name	WCI Current Watershed Condition Index	WCI (PVT) Future Watershed Condition Index	WCI (A) Future Watershed Condition Index	WCI (B) Future Watershed Condition Index	WCI (C) Future Watershed Condition Index	WCI (D) Future Watershed Condition Index	WCI (E) Future Watershed Condition Index	WCI (PA) Future Watershed Condition Index
(Benton County)								
Alsea Frontal	41	39	45	46	41	42	42	42
Crooked Creek	36	34	34	34	36	37	36	36
Fall Creek	60	56	69	68	57	57	60	57
Lower Lobster	42	38	50	49	40	39	42	40
Lower So Fk Alsea	38	40	54	59	45	51	48	47
North Fork Alsea	38	46	54	60	48	46	49	47
Upper Lobster	52	40	58	49	61	40	40	41
Upper So Fk Alsea	26	25	33	30	30	29	28	32
(Polk & Lincoln Co.)								
Gooseneck Creek	76	75	78	78	76	75	75	75
Mill Creek	43	145	172	161	154	145	146	146
North Fork Siletz	80	124	138	136	125	126	125	125
Pedee Creek	107	113	131	121	119	113	113	113
Rowell-Gold Creek	108	93	102	99	104	94	93	94
Upper Rickreall Ck	86	180	180	180	180	187	184	181
(Tillamook & Yamhill Co.)								
Bear Creek (Salem)	46	42	78	65	47	42	47	47
Bible Creek	53	46	54	52	51	46	49	52
Clear Ck (Kilchis)	54	90	122	112	93	105	103	90
Elk Creek (Nestucca)	41	38	62	60	39	38	42	38
Kilchis Frontal	46	173	232	254	215	207	217	174
Moon Creek	59	69	93	80	76	69	72	73
Testament Creek	70	56	91	86	81	56	64	76
Upper Nestucca	53	56	81	75	60	57	60	58
Upper Willamina	52	48	64	63	53	51	54	57
(Washington & Columbia Co.)								
East Fork Nehalem	50	67	67	67	67	74	71	73
(Clackamas Co.)								
Table Rock Fork	35	57	73	73	58	60	60	61
Upper Molalla River	88	102	110	113	107	102	104	103
(Marion Co.)								
Quartzville Creek	118	101	133	130	106	102	102	101

	(Current) Percent Equivalent Clearcut Acres	(PVT) Percent Equivalent Clearcut Acres	(A) Percent Equivalent Clearcut Acres	(B) Percent Equivalent Clearcut Acres	(C) Percent Equivalent Clearcut Acres	(D) Percent Equivalent Clearcut Acres	(E) Percent Equivalent Clearcut Acres	(PA) Percent Equivalent Clearcut Acres
(Benton County)								
Alsea Frontal	13.4	11.5	15.3	16.7	13.6	13.4	13.3	14.0
Crooked Creek	8.9	7.7	7.7	7.8	10.7	9.7	7.7	9.1
Fall Creek	12.3	9.3	14.2	14.3	10.2	9.4	13.1	9.6
Lower Lobster	12.1	9.8	18.0	17.1	11.5	10.1	16.0	10.9
Lower So Fk Alsea	10.9	9.9	16.7	19.2	12.3	15.5	12.9	13.5
North Fork Alsea	12.2	13.3	18.2	21.7	17.0	13.3	18.9	14.2
Upper Lobster	11.3	7.6	17.5	13.1	19.1	7.6	8.0	8.4
Upper So Fk Alsea	11.3	9.7	16.5	14.2	14.9	13.8	10.6	15.9
(Polk & Lincoln Co.)								
Gooseneck Creek	12.1	14.4	15.5	15.7	15.0	14.4	14.5	14.5
Mill Creek	11.8	21.0	24.7	23.3	22.7	21.0	21.2	21.5
North Fork Siletz	13.4	18.2	21.1	20.6	19.0	18.4	18.2	18.5
Pedee Creek	12.1	26.6	33.9	29.9	28.9	26.6	26.7	26.6
Rowell-Gold Creek	15.0	12.0	14.8	13.9	16.1	12.2	12.1	12.4
Upper Rickreall Ck	9.4	24.2	24.2	24.2	24.3	25.7	24.2	24.6
(Tillamook & Yamhill Co.)								
Bear Creek (Salem)	14.0	10.2	32.1	24.9	15.7	10.2	22.4	14.1
Bible Creek	15.3	9.7	14.0	13.3	13.4	9.9	13.5	13.7
Clear Ck (Kilchis)	12.3	22.8	34.2	31.4	25.4	28.8	26.5	22.9
Elk Creek (Nestucca)	12.9	10.5	26.8	25.9	11.6	10.5	20.6	11.1
Kilchis Frontal	10.0	19.5	26.9	29.5	26.0	23.9	26.3	19.7
Moon Creek	13.9	13.6	22.9	18.3	16.1	13.6	17.3	15.2
Testament Creek	17.6	10.7	27.6	25.4	22.6	10.7	23.8	20.9
Upper Nestucca	14.9	15.6	29.1	26.2	18.2	15.9	21.5	17.1
Upper Willamina	13.0	10.1	18.9	18.1	13.4	11.8	16.2	15.0
(Washington & Columbia Co.)								
East Fork Nehalem	16.0	20.2	20.5	20.5	20.8	24.4	20.4	23.8
(Clackamas Co.)								
Table Rock Fork	5.0	13.7	21.4	21.4	14.7	15.1	15.8	15.9
Upper Molalla River	17.2	18.3	21.1	22.0	21.0	18.3	20.1	18.6
(Marion Co.)								
Quartzville Creek	13.9	7.5	16.0	15.5	8.8	7.9	7.5	7.5

	(Current) Percent Compacted	(PVT) Percent Compacted	(A) Percent Compacted	(B) Percent Compacted	(C) Percent Compacted	(D) Percent Compacted	(E) Percent Compacted	(PA) Percent Compacted
(Benton County)								
Alsea Frontal	8.3	8.1	8.6	8.4	8.3	8.2	8.2	8.3
Crooked Creek	6.3	6.2	6.2	6.2	6.4	6.3	6.2	6.3
Fall Creek	6.8	6.8	7.5	7.2	6.9	6.8	7.1	6.8
Lower Lobster	7.3	7.2	7.8	7.8	7.4	7.3	7.7	7.4
Lower So Fk Alsea	9.1	9.3	9.8	10.0	9.7	9.8	9.6	9.7
North Fork Alsea	8.0	8.4	8.8	9.0	8.7	8.5	8.8	8.5
Upper Lobster	6.3	6.1	6.7	6.4	6.8	6.1	6.1	6.1
Upper So Fk Alsea	8.3	8.2	8.8	8.6	8.7	8.5	8.3	8.8
(Polk & Lincoln Co.)								
Gooseneck Creek	9.8	10.0	10.1	10.1	10.1	10.0	10.0	10.0
Mill Creek	5.4	13.6	13.8	13.7	13.7	13.6	13.6	13.6
North Fork Siletz	9.0	11.2	11.4	11.3	11.3	11.3	11.2	11.3
Pedee Creek	14.5	15.3	15.8	15.7	15.6	15.5	15.5	15.5
Rowell-Gold Creek	10.2	9.8	10.0	10.0	10.1	9.9	9.9	9.9
Upper Rickreall Ck	7.6	12.3	12.6	12.6	12.6	12.7	12.6	12.6
(Tillamook & Yamhill Co.)								
Bear Creek (Salem)	8.5	8.4	9.2	8.9	8.5	8.4	8.8	8.5
Bible Creek	8.5	8.2	8.4	8.3	8.4	8.2	8.3	8.4
Clear Ck (Kilchis)	6.0	7.8	8.5	8.3	8.1	8.2	8.2	8.1
Elk Creek (Nestucca)	6.1	6.2	6.8	6.8	6.2	6.2	6.6	6.2
Kilchis Frontal	4.7	9.4	10.0	10.1	10.0	9.8	10.0	9.6
Moon Creek	6.4	7.0	7.4	7.2	7.2	7.1	7.2	7.1
Testament Creek	9.7	9.4	10.0	9.9	10.0	9.4	9.9	9.9
Upper Nestucca	8.3	8.9	9.4	9.3	9.0	8.9	9.2	9.0
Upper Willamina	7.6	7.5	7.9	7.8	7.6	7.6	7.8	7.8
(Washington & Columbia Co.)								
East Fork Nehalem	10.8	12.3	12.4	12.4	12.4	12.6	12.4	12.6
(Clackamas Co.)								
Table Rock Fork	5.5	6.5	6.9	6.9	6.5	6.6	6.6	6.6
Upper Molalla River	10.7	11.5	11.7	11.8	11.7	11.6	11.7	11.6
(Marion Co.)								
Quartzville Creek	8.9	8.6	8.9	8.9	8.6	8.6	8.6	8.6

Appendix 4-E Watershed Condition Index

The watershed condition index (WCI) described in chapter 3 and appendix 3-H has been used to analyze short-term changes in general watershed condition on the 27 selected analytical watersheds. BLM management activities in these watersheds could have an appreciable effect on cumulative general watershed conditions.

Management activities on other lands tend to mask the impacts and recovery on BLM-administered lands. This is especially true where the extent of BLM-administered lands is limited. The WCI is a blend or average of all the various conditions, such as slope, soil stability, vegetation, roads, management activities and other factors found throughout any watershed. Changes in conditions (logging, regrowth of forest vegetation, etc.) on only a minor portion of a watershed would not cause a perceptible change in the WCI. Conditions on the majority of the watershed will dictate the overall general watershed condition. Impacts from small portions of watersheds may have major impacts on water quality and would be considered and analyzed during project design.

The first step in the analysis was to calculate WCIs for anticipated management activities on private lands (PVT) within the selected watersheds. These will serve as a baseline for comparing changes in cumulative general watershed condition due to the potential BLM management activities identified in the alternatives. This analysis takes into account the natural recovery rates and regrowth occurring on all lands within the watersheds. Management activities on BLM-administered lands were excluded from this calculation.

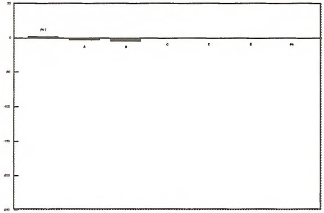
The second step in the analysis was to calculate WCIs by selected watershed and alternative and for all anticipated public and private land management activities. The anticipated management activities on private lands used in the first WCI analysis were fixed for all of the subsequent runs. On BLM-administered lands potential roads, harvest units, logging methods and type of entry (clearcut, thinning, shelterwood) were identified for each alternative and incorporated into the WCI analysis for each alternative.

The following graphs display the change in the WCI from the current condition (see chapter 3). These are the anticipated watershed changes for the various analyses (PVT, alternatives A - PA). The change in the WCI is graphed as current condition minus anticipated future condition. A positive change on the graph indicates improving general watershed conditions. A change of around 25 points or less in the WCI, over the expected life of the plan, indicates only a minor change in the general watershed condition. A change of around 50 points or less (greater than 25) indicates a moderate change. The bars on the graph show the anticipated watershed changes under each alternative. Comparing the PVT bar with those of the alternatives indicates how much is actually attributable to the potential BLM management activities.

In addition the data collected in the WCI calculation also provides for an estimation of Equivalent Clearcut Acres (ECA) in percent of the total watershed. The ECA helps to estimate the total effect on water yield and flood duration. The ECA consists of recent clearcuts in various stages of recovery up through age 20, roads, and areas of brush and grass and other partially recovered areas. The WCI data also provides for an estimate of total cumulative compaction (percent) in a watershed (roads, skid trails, etc.) which gives an indication of the potential increase in peak flows and erosion which may occur within a watershed. Generally, the higher the compaction the greater the effect on increasing peak flows and erosion rates.

Change in WCI Over Planning Period

Alsea Frontal

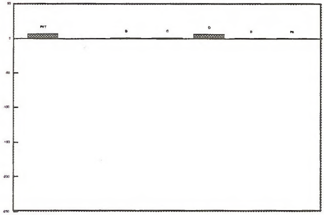


Change in WCI Over Planning Period

Bear Creek (Salem)

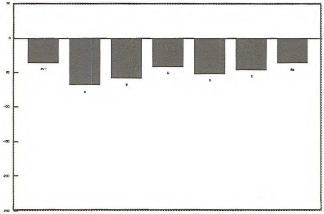
Change in WCI Over Planning Period

Bible Creek



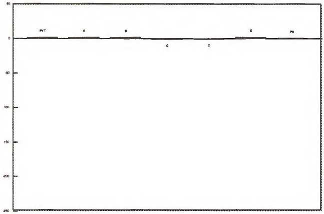
Change in WCI Over Planning Period

Clear Creek (Kilchis)



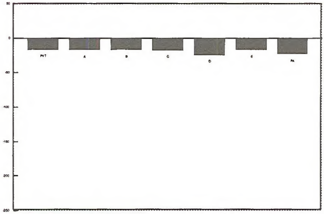
Change in WCI Over Planning Period

Crooked Creek

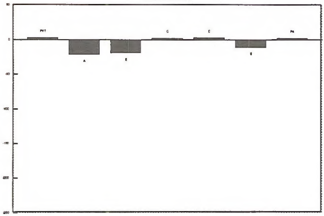


Change in WCI Over Planning Period

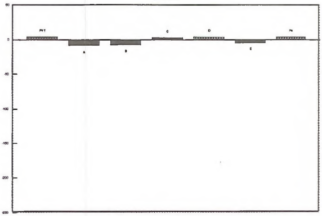
East Fork Nehalem



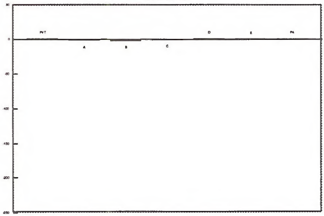
Change in WCI Over Planning Period
Elk Creek (Nestucca)



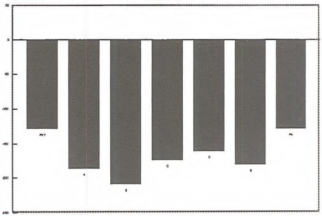
Change in WCI Over Planning Period
Fall Creek



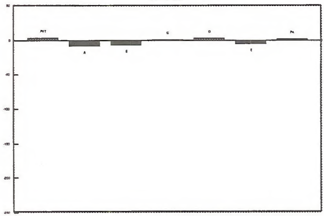
Change in WCI Over Planning Period
Gooseneck Creek



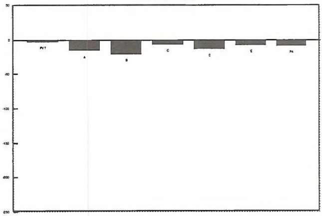
Change in WCI Over Planning Period
Kilchis Frontal

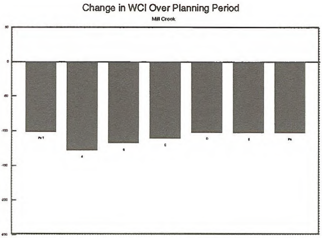


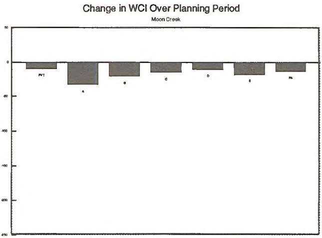
Change in WCI Over Planning Period
Lower Lobster

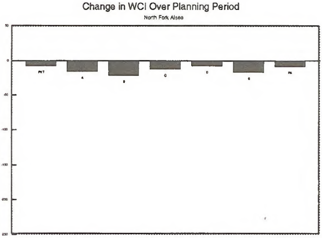


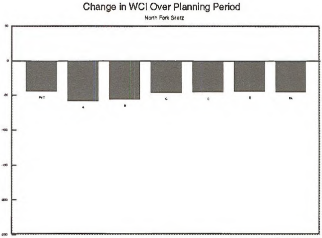
Change in WCI Over Planning Period
Lower South Fork Alsea

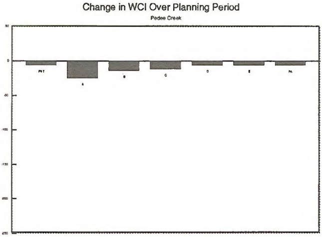


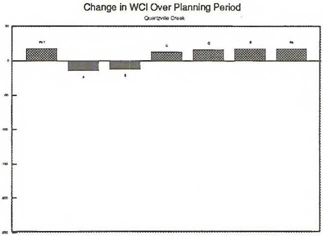

Change in WCI Over Planning Period
Mill Creek


Change in WCI Over Planning Period
Moon Creek


Change in WCI Over Planning Period
North Fork Alsea

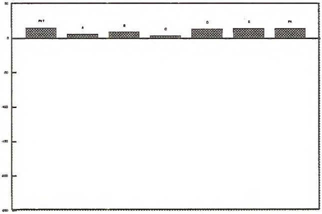

Change in WCI Over Planning Period
North Fork Siletz


Change in WCI Over Planning Period
Pedee Creek


Change in WCI Over Planning Period
Quartzville Creek

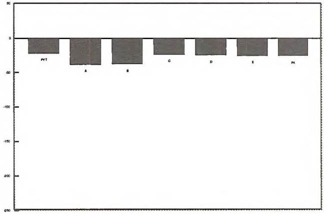
Change in WCI Over Planning Period

Rowell-Gold Creek



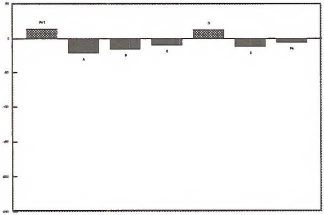
Change in WCI Over Planning Period

Table Rock Fork



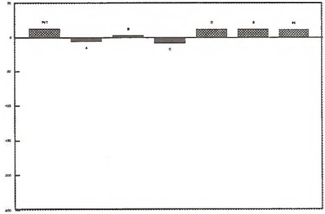
Change in WCI Over Planning Period

Testament Creek



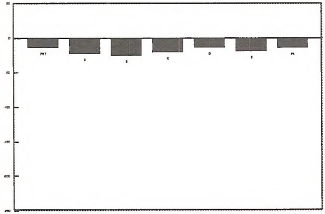
Change in WCI Over Planning Period

Upper Lobster



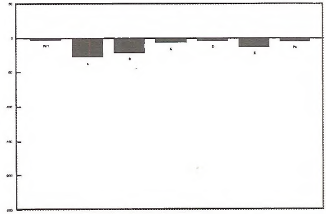
Change in WCI Over Planning Period

Upper Molalla River



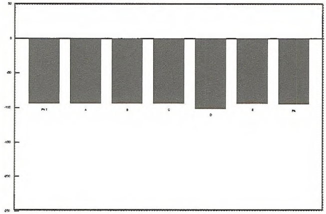
Change in WCI Over Planning Period

Upper Nestucca



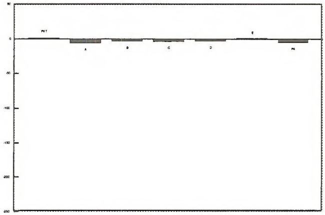
Change in WCI Over Planning Period

Upper Rickreall Creek



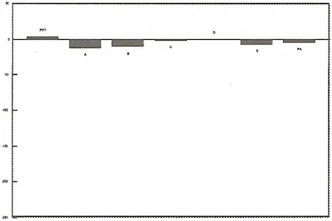
Change in WCI Over Planning Period

Upper South Fork Alsea



Change in WCI Over Planning Period

Upper Willamina



Appendix 4-F Wildlife Analytical Techniques

Elk

Analytical Question

What assessment method would be used to determine how the RMP alternatives would impact important wildlife habitats and populations?

Subquestion

What method should be used to analyze impacts on Roosevelt elk habitat and populations? How should the selected model be used to analyze alternatives?

Assessment Method

Wisdom et al., A Model to Evaluate Elk habitat in Western Oregon (modified)

The Wisdom Model is modified to reflect the scale of planning at the forestwide level. The major modification is to drop the spacing index (HEs). The HE_r index will be calculated for BLM and non-BLM lands within the analysis areas, but the HE_c and HE_f indices would be calculated only for BLM lands due to the lack of vegetation data for non-BLM lands.

Assumptions/Comments

1) Evaluations would be conducted for each elk management area (or watershed) with substantial existing or potential elk use and where BLM has at least 25 percent ownership. Areas with less than 25 percent BLM ownership may be analyzed if BLM-administered land contributes importantly to elk management. (Future operational analyses would include 2-10,000 watersheds generated by WODDB).

2) See Wisdom et al. (p. 11) for a complete list of assumptions pertinent to use of the model.

3) Use the following forest stages as a guide (ages may vary between districts due to differences in forest types and management regimes):

Forage areas = 0-20 years
Hiding cover = 21-50 years with appropriate stocking classes
Thermal cover = 51-160 years with appropriate stocking classes
Optimal cover = 160+ years with appropriate stocking classes.

Analytical Techniques

1) Road Density (HE_r):

a) Determine miles of drivable roads within each elk management area (or watershed) for the existing condition. Divide miles of road by acres of WODDB coverage within each area to determine road density. Compare density to the desired 1.5 mile benchmark suggested by ODFW (Forest Habitat Protection Criteria for BLM lands).

b) Estimate shifts in HE_r within each analysis area by reference to the 10 Year Timber Harvest Scenario (i.e., determine proposed road construction levels over the next decade and recalculate HE_r).

c) Write narrative to predict long-term impacts (100 years) of road construction on elk for BLM and non-BLM administered lands.

2) Cover Quality (HE_c):

a) Determine the amount of optimal (0) thermal cover, thermal (T) cover, hiding (H) cover and forage (F). Individual OI polygons have already been tagged with the above codes (i.e., O, T, H, F: refer to the HEC attribute within the FOI themes). Calculate HE_c according to Wisdom Model. Calculate percent optimal thermal cover, percent thermal cover, percent hiding cover, and percent forage in area and compare to ODFW benchmarks (Forest Habitat Protection Criteria for BLM Lands).

b) Estimate shifts in HE_c and cover and forage percentages within each analysis area by reference to the 10 Year Timber Harvest Scenario.

c) Write narrative to predict long-term impacts (100 years) on HE_c and cover and forage percentages for BLM lands.

3) Forage Quality (HE_f):

a) Use HE_f attribute in FOI theme to determine acres of forage by quality classes as described in Wisdom Model (p. 29).

b) Calculate HE_f index according to Wisdom Model.

c) Estimate shifts in HE_f within each analysis area by reference to the 10 Year Timber Harvest Scenario.

d) Write narrative to predict long-term impacts (100 years) on HE_f for BLM lands.

Display Techniques

Display road density (or HE_r), HE_f, HE_c, and percentages of O, T, H, F for each elk management area (or watershed) for existing condition and at end of 10 years (see below).

Snags

Subquestion II. What method should be used to predict the number of snags that would be available for each alternative and how this relates to changes in population levels of cavity-users?

Assessment Method

Neitro et al. method to analyze multiple species snag requirements (described in Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington edited by E. Reade Brown, 1985).

Assumptions:

a) Method assumes that by managing for dominant woodpeckers, requirements of other cavity users will be fulfilled.

b) Method assumes direct correlation between snag densities and population densities of cavity users.

c) Method assumes the following minimum guidelines have been established for most alternatives (except alternatives where minimum standards of Oregon Forest Practices Act rules apply):

> Wildlife trees will be greater than 10 inches dbh and at least 20 feet tall; no more than 5 percent of the trees left will be under 15 inches dbh, at least 5 percent of the trees left will be over 30 inches dbh, and the remainder will be over 15 inches dbh.
>
> Leave all soft snags except where they are unacceptable for safety, logging systems, or burning considerations.
>
> Leave hard snags, or green trees if needed for snag mitigation purposes, both to provide the current needs of hard-snag-dependent species, and to serve as a source of future soft snags.
>
> Distribute hard snags according to the following criteria: in harvest units, retain the number of hard snags or green trees to support the desired population of dominant woodpeckers (individually scattered or in clumps larger than two acres); retain all hard snags in areas reserved from timber harvest (e.g., nonsuitable woodland, protected old growth/spotted owl, riparian, bald eagle).

Analytical Techniques:

a) Estimate existing snag levels for each forest age class. These snag levels may be estimated from projections of snag densities currently being measured on timber inventory plots (or by using other data already collected including snag data from literature sources). Snag densities are presently being determined for the following conifer age classes: 1-30, 40-80, 90-190, and 200+. hardwood stands are also being measured. See BLM's Forest Inventory Field Instructions for Western Oregon for further details. Snag densities for other habitats such as nonsuitable woodlands and riparian management areas (RMA) may be estimated from timber inventory plots (or by use of other data if available) if age classes are known.

b) Estimate snag densities for each age class for the range of alternatives (see the following table) after evaluating the strategy of each alternative to provide habitat for cavity dwellers.

c) Convert calculated snag densities into districtwide estimates of potential population levels (percent of maximum potential population levels) of dominant woodpeckers for each alternative (see Neitro et al., p. 145).

d) Conduct analysis for short term and long term (100 years).

e) In a narrative, discuss cumulative effects of the alternatives on cavity-users.

Display Technique:

Display estimated population levels of dominant woodpeckers at end of 10 and 100 years as indicated below.

Calculation of Snag Densities (long term example)

	Existing Condition			Alternative A			Alternative D		
Age Class	Acres	Snags/ Acre	Total Snags	Acres	Snags/ Acre	Snags	Total Acres	Snags/ Acre	Total Snags
0-30	3,000	1	3,000	9,000	0	0	8,000	1	8,000
40-80	10,000	1	10,000	10,000	1	10,000	8,000	2	16,000
90-190	5,000	2	10,000	500	2	1,000	2,000	2	4,000
200+	2,000	3	6,000	500	3	1,500	2,000	3	6,000
Totals	20,000		29,000	20,000		12,500	20,000		34,000

Snag density for entire forest (No./acre)

29,000/20,000=1.5	0.6	1.7

Estimated Population levels (Percent of maximum potential) of Dominant Woodpecker Populations at End of First Decade (example)

	Alternatives							
Existing Populations	NA	A	B	C	D	E	F	PA
50		20	30	40	70			

Appendix 4-G Methodology for Assessing Effects on Fish Habitat and Populations

Assumptions

1. Stream inventory data are available.
2. Fish species distribution is accurate based on current ODFW and BLM surveys.
3. Fish density, survival and exploitation estimates are provided through consultation with ODFW.
4. Riparian tree size (from the Operations Inventory) is directly related to habitat quality and fish populations, assuming other factors (e.g., water diversion or sedimentation) are not limiting.
5. Streams are fully seeded (i.e., adequate number of adult fish) under short and long-term population estimates.
6. Food supply is directly linked to habitat quality rating.

Smolt Densities By Habitat Quality Ratings

		Smolts/ft²			
Species	Stream Order/ Gradient	Good/ Optimal	Fair	Minimal	
Coho salmon	2-6/ 0-3%	0.028	0.014	0.007	
	2-5/ 3%+	0.00	0.00	0.00	
	7-9/ 0-3%	0.003	0.002	0.001	
Steelhead	2-5/ 0-3%	0.003	0.002	0.001	
	2-5/ 3%+	0.007	0.004	0.002	
	6-9/ 0-3%	0.002	0.001	0.0005	
Cutthroat trout	2-5/ 0-3%	0.0015	0.001	0.0005	
	2-5/ 3%+	0.0035	0.002	0.001	
	6-9/ 0-3%	0.001	0.0005	0.00025	
Chinook salmon				Smolts (migrants)/ft²	
Spring chinook	Any stream reach used annually as spawning and rearing habitat		0.011	0.006	0.003
Fall chinook	Any stream reach used annually for spawning and early rearing; usually 4th order and higher streams with less than 3% gradient		0.04	0.02	0.01
Spring and fall chinookproduction value was used	Any stream reach used by spring and fall chinook; average smolt		0.026	0.013	0.006

In addition to the other habitat characteristics used to describe chinook salmon habitat quality for each stream reach, the amount of suitable spawning area that applies to each category is as follows:

Good/Optimal - 25 percent or more
Fair - 10-24 percent
Minimal - Less than 10 percent

Fall chinook rear for only a short time in spawning tributaries and most mainstream spawning areas.

Analytical Technique

The habitat quality model which rates stream reaches as minimal, fair, good/optimal requires estimation of species population carrying capacity. The following steps were used to develop the information for the fisheries portion of the RMP/EIS.

1. Identify all fish inhabited reaches and segregate by species.
2. Determine the expected short and long-term habitat quality rating for each reach.
3. Using the habitat quality rating, estimate the smolt production capacity for each anadromous species by reach. Summarize reach data by watershed, resource area, and district.
4. Develop population estimates in consultation with ODFW personnel for basins within the planning area.
5. Using projected habitat changes, estimate a long-term and a short-term trend for the habitat and the population.
6. When assessing the quality of habitat, base the primary rating upon the average tree size (dbh) in the riparian area. However, a related factor analysis must be conducted to determine if other factors are affecting the quality of the reach. Examples: The withdrawal of water for irrigation or heavy sediment yield in a watershed may lower a rating based on large tree size. Rehabilitation/enhancement with structures may raise a rating based on small tree size. The availability of abundant natural structure, beaver dams, or side channels may also raise the rating of a reach.

Smolt Survival & Exploitation (Fishing) Rates

	Percent of Population	
Species	Smolt Survival to Adult	Fishing Rate[1]
Coho	7.5	69
Steelhead	10.0	30
Cutthroat	30.0	20
Chinook		
- Spring	10.0	60
- Fall	9.0	60

[1] The percentage of adult fish caught through commercial and sport fishing.

Smolt densities were determined collectively with the Oregon Department of Fish and Wildlife. Considerable natural variability in fish production occurs between years and between streams. For example, a 20 percent variability in coho smolt production occurred in Deer Creek during different years, and the observed range of coho smolts produced per mile in different streams was 453 to 2,110 (Beidler et al. 1980) due to different habitat conditions (e.g., stream width, gradient, percent pools, etc.).

Appendix 4-H. Hexagon Plots for Western Oregon

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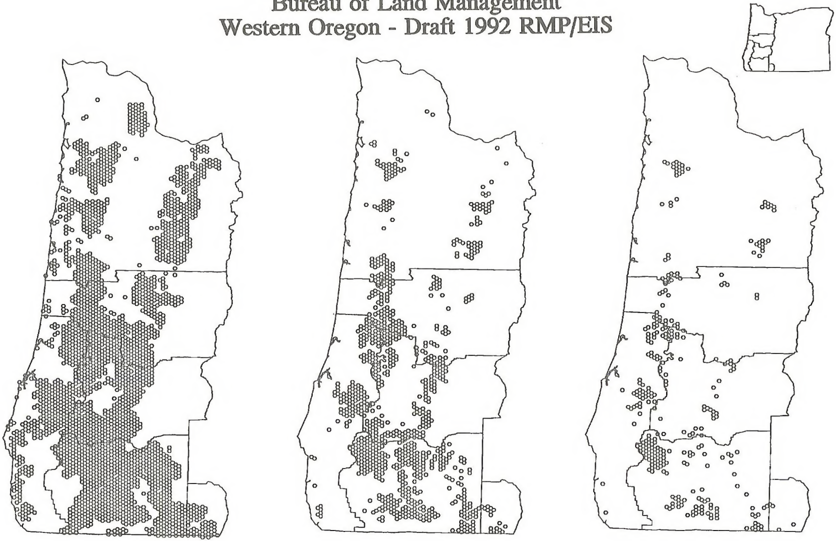

0-100% BLM OWNERSHIP

40-100% OWNERSHIP

60-100% OWNERSHIP

Percent BLM Ownership within 2500 acre Hexagons

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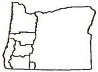

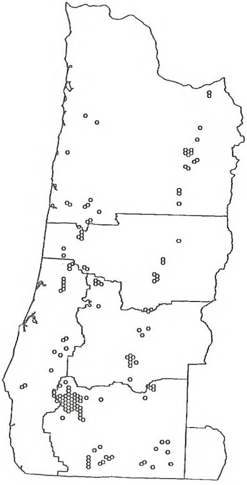

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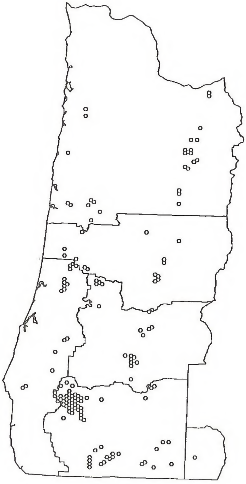

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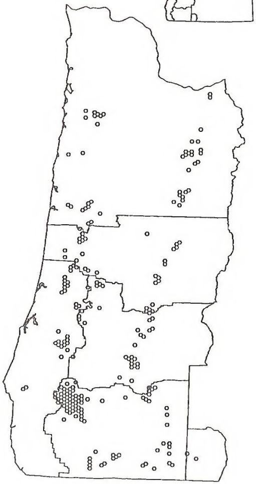

ALTERNATIVE C

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 10 Years

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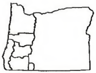

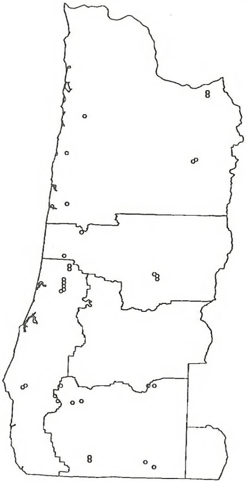

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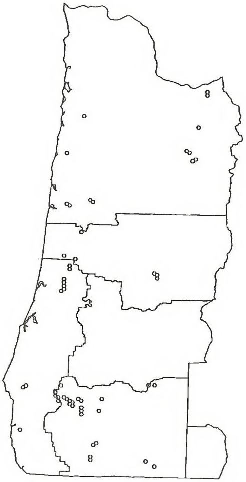

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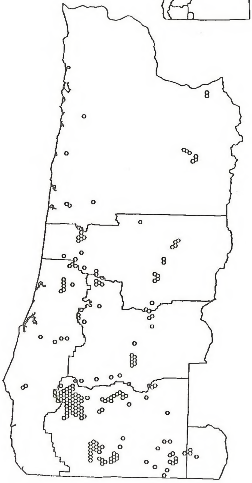

ALTERNATIVE C *

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 50 Years

* ALTERNATIVE C - AFTER 70 YEARS

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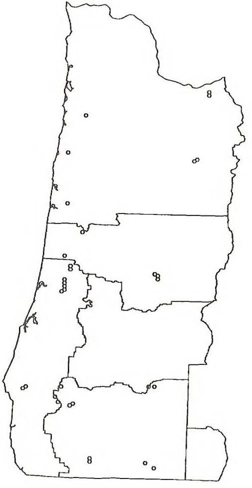

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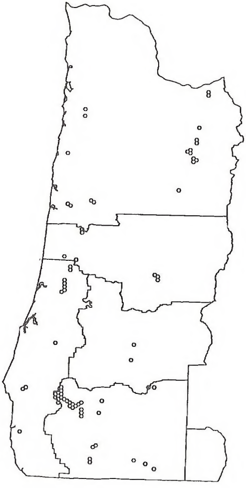

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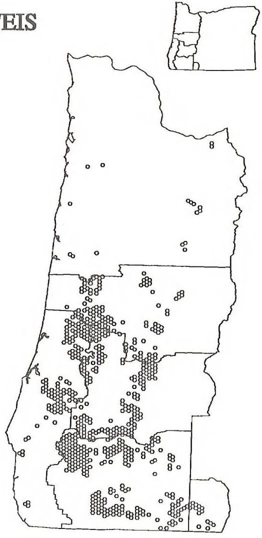

ALTERNATIVE C

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 100 Years

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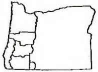

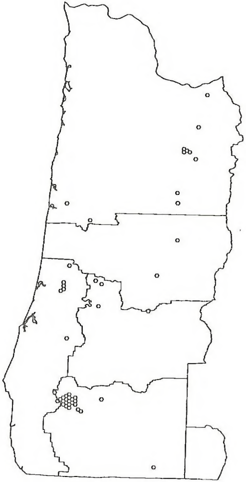

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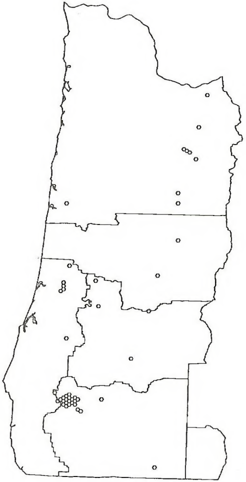

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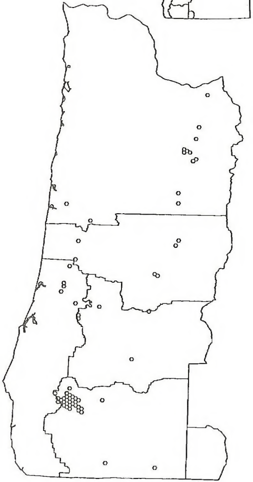

ALTERNATIVE C

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 10 Years

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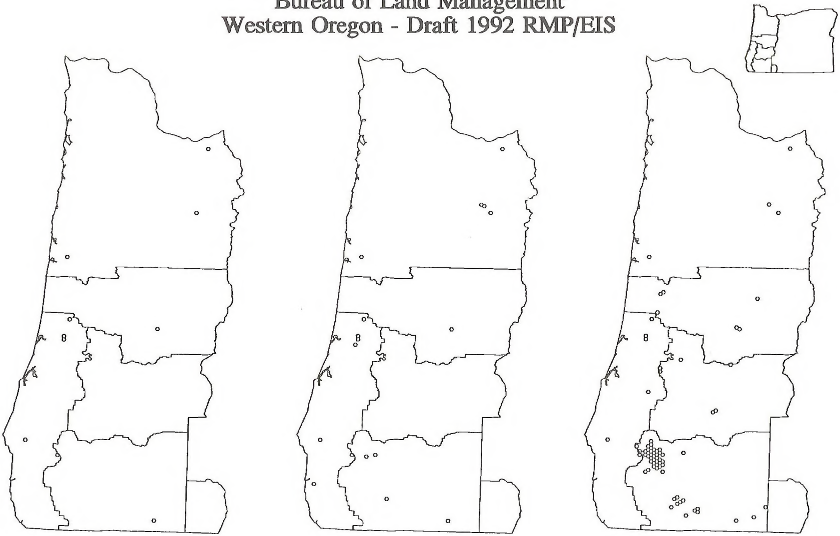

ALTERNATIVE A

ALTERNATIVE B

ALTERNATIVE C *

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 50 Years

* ALTERNATIVE C - AFTER 70 YEARS

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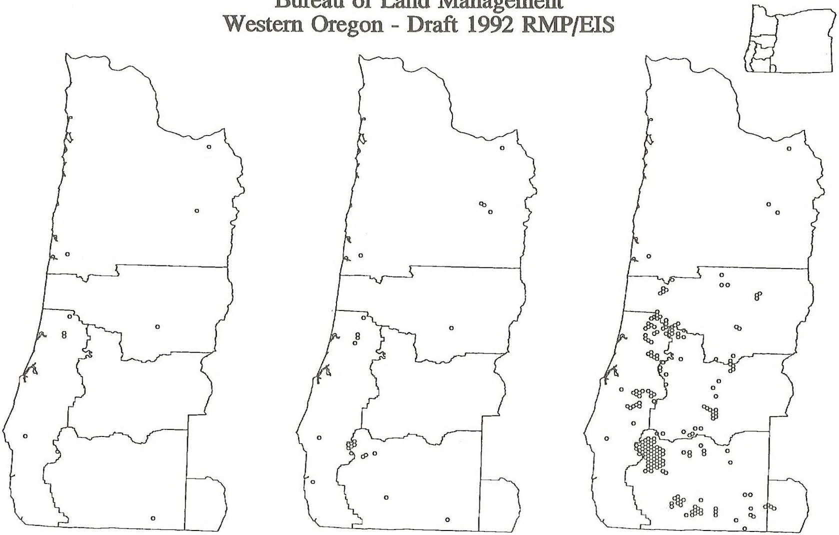

ALTERNATIVE A   ALTERNATIVE B   ALTERNATIVE C

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 100 Years

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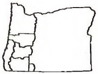

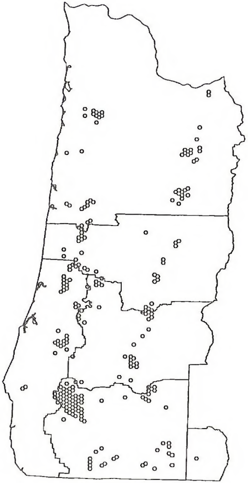

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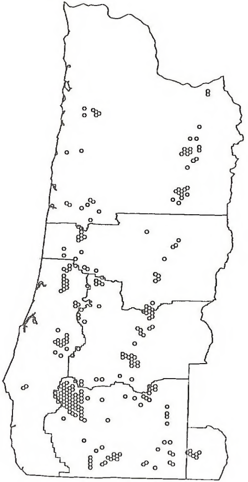

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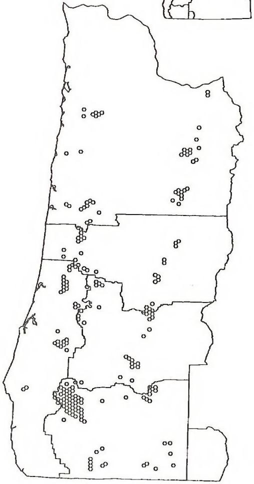

PREFERRED ALTERNATIVE

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 10 Years

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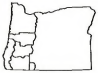

ALTERNATIVE D   ALTERNATIVE E   PREFERRED ALTERNATIVE

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 70 Years

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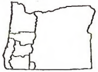

ALTERNATIVE D ALTERNATIVE E PREFERRED ALTERNATIVE

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 100 Years

U.S. DEPARTMENT OF INTERIOR

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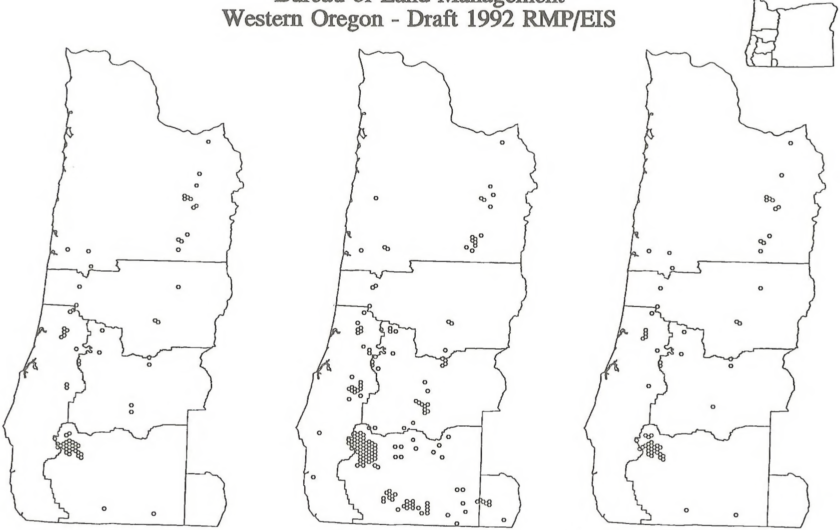

ALTERNATIVE D

ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 10 Years

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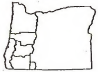

ALTERNATIVE D

ALTERNATIVE E

PREFERRED ALTERNATIVE

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 70 Years

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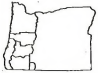

ALTERNATIVE D | ALTERNATIVE E | PREFERRED ALTERNATIVE

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 100 Years

Appendix 4-I. A Spatially Explicit Life-History Simulator for the Northern Spotted Owl

Kevin McKelvey, ***Wildlife Biologist, USDA Forest Service PSW***
June 16, 1992

Introduction

The probability of an organism surviving a specif ied time interval is the product of the probabilities of surviving a series of discrete risks distributed across that interval: the risks include predation, starvation, exposure to the elements, and disease. Similarly, the probability of an organism successfully reproducing is linked to the ability to find a mate, the risks to the offspring, and the metabolic constraints imposed on the adults. The fundamentals of both birth and death processes are therefore based on the environmental properties of the area in which the organism exists and to its proximity to potential mates. To survive in a heterogeneous environment, an organism preferentially inhabits habitat favorable to its survival and avoids barren or dangerous areas. The animal's movement and response to environmental heterogeneity is therefore evolved to exploit the use of available resources so as to maximize lifetime reproductive output.

Habitat dependencies for survival and reproduction are fundamental to population ecology, and yet they are seldom incorporated into population models. In traditional modeling, these relationships are largely ignored. Mating efficiency, survival to first breeding and the metabolic status of the parents are all, for example, encompassed by two parameters: the observed birth rates and prereproductive survival rates. Given just these parameter estimates all of the complexities associated with the interface between the organism and the environment are lost. If the habitat remains constant, this is an acceptable simplification. however, management activities and disturbance events alter the habitat in which the organism exists, then the interface between the organism and its environment must be modeled explicitly. In forestry, for instance, management consists primarily of vegetative manipulation resulting in habitat change. Forest management, from a wildlife standpoint, is a vegetation treatment experiment in which wildlife population levels are important dependent variables.

To project the impacts of land management activities, models must relate population demographics explicitly to the landscape in which the organism exists. Otherwise, there can be no assessment of the potential impact of a change in landscape pattern. In addition, if the pattern of manipulation leads to a fragmented system, then the spatial relationships between the various treatments must be explicit as well.

A spatially explicit model that directly links habitat variation to demographic variation is therefore essential to assess population viability. In addition, such a model allows the efficacy of various landscape patterns to be tested and provides a means to explore interactions between the distribution, amount and quality of habitat and population dynamics (Urban et al. 1988, Pulliam et al. unpublished) . In this type of model, habitat quality is defined in terms of demographic parameters. Habitat is 'suitable' for an organism if organisms that utilize that type of habitat either have high survival rates, high birth rates or both. In particular, suitable habitat can be defined as habitat in which the combination of birth and death rates allows for a stable or increasing population.

The northern spotted owl (*Strix occidentalis caurina*), is a habitat specialist that utilizes late-seral-stage forests (Thomas et al. 1990). The acreage in these timber types has declined rapidly since the late 1940's, due primarily to high levels of timber harvest (Thomas et al. 1990), and the pattern of harvest on the landscape has lead to a high degree of fragmentation in the remaining habitat. The spotted owl is a monogamous breeder, territorial, with large (>1000 ha) home ranges (Thomas et al. 1990, Appendix I), and obligate juvenile dispersal. Juvenile dispersal ability is limited; the longest published straight-line juvenile dispersal distance is 62 miles (100 km) (Thomas et al. 1990, Appendix P, Table Pl) . Given obligate dispersal and uncertainties associated with mate f inding, it is likely that isolation and f ragmentation on the scale of the home range will have an impact on the ability of dispersing owls to colonize new territories and form breeding pairs.

The Model

A spatial model was created to simulate the impact of forest management on populations of the northern spotted owl. The basic premise of the model is that an

organism's survival and reproduction can be linked explicitly to its immediate habitat and that habitat's context within the larger landscape. That is, a population's rates of survival and fecundity will vary based on map configuration. In addition, the model allows for habitat areas that are unsuitable or marginally suitable for nesting. Lastly, the model assumes that each organism must search the landscape to find a mate.

The model is a single-organism simulator. Each organism is born, moves, attempts to find a mate and breed, and dies. This format allows the behavior of each individual to be simulated by following a series of probabilistic rules rather than through the abstraction of an equation set. The model is flexible, allowing for the analyses of individual characteristics as well as population dynamics. The average distance moved by individual birds before death or pairing, for example, can be output, and thus compared with data from banding or telemetry studies to determine if the simulated movement produces a path-length similar in magnitude to the observed behavior.

Model Details

Life History

The model partitions owls into classes based on age, sex, and breeding status. Because it is not possible to determine the age of adult ($\geq$ 2 years of age) owls in the field, a stage-structured modeling approach (Lefkovitch, 1965, Caswell 1989, Thomas et al. 1990: Appendix L) has been adopted. Both sexes are modeled, with birds partitioned into three stage classes: first year birds (juveniles), second year birds (sub-adults), and birds older than two years (adults). Two classes of paired birds are recognized, sub-adults and adults (Fig. 1). A sub-adult pair is defined as a pair containing at least one sub-adult bird. The age of f irst breeding is at 1 year, with one-year-old birds given a lower fecundity rate than older birds.

Males

Males are born and disperse f rom the nest site looking f or acceptable habitat to set up a territory. Determination of site suitability is a probabilistic process. As the site quality decreases, the probability that a male will decide that a site is suitable also decreases. The probability that a male becomes territorial on a site of a given quality is referred to here as the settling rate. If a suitable nest site is found, males stop moving and become territorial. Territorial males remain on this site until they die or the site becomes unsuitable for nesting. If the site becomes unsuitable, then the males become non-territorial and reinitiate search (Fig. 2).

Females

Females are born and disperse from the nest site looking for territorial males. When they find a territorial male, they obligately pair (Fig. 3). Once paired, females remain on the site until they die or the site becomes unsuitable for nesting.

Pairs

Pairs split up only when one member of the pair dies, or the site becomes unsuitable for nesting. If the female dies, the male remains territorial and stays on the site. If the male dies the female has no fidelity to the site and will initiate searching for a new mate (Fig. 4). If the site becomes unsuitable for nesting, both members search for a new site independently.

Movement from one age-class to another

As owls age, they move from juveniles to sub-adults and finally to adults. Survival probabilities are evaluated at each movement step within the annual interval and remain constant throughout the year. At the end of the year all birds still alive move to the next stage. Years start at the birth pulse.

The impact of shifting vegetation patterns on life-histories

In the model, changes in habitat quality can be made at the start of any annual cycle. If these changes result in the previously suitable occupied sites becoming less suitable, then the territorial status of the owls occupying those areas may be changed. Territorial males, whether paired or not, become nonterritorial at a rate of (i - the specified settling rate) for the land classification. If the males are paired and remain territorial, then the pair remains intact. If not, the pair breaks up into a non-territorial male and a female, and both birds begin independent search for new habitats. All owls will immediately be subject to the probabilities of survival and fecundity associated with the altered landscape.

Survival

Mortality is assumed to result from either starvation or predation, and these factors are assumed to be additive. Both factors are linked to site. Total risk is simply (l - survival probability). Survival probability is

evaluated based on habitat quality of the site currently occupied. Because risks are assumed to be constant over the course of the year, if the year is broken up into i time-steps, the risk per step f or an owl in stage j occupying habitat type k is defined as:

$$Rt = 1 - (1 - R_{jk})^{1/i}$$

where Rt is the Risk per time step and Rik is the yearly risk as defined for age class j and habitat class k. In pairs, the survival of each member is determined by their stage as well.

Movement

The map is divided into a f ixed array of grid cells, each cell representing one territory-sized unit. The grid is hexagonal to allow more realistic movement than is provided by a square grid (Pulliam et al. 1992, Lamberson and Voss, Personal communication). The rate of movement is dependent on the size of the grid cells and the number of time-steps per-year. Individual moves are restricted to adjacent cells. All of the mobile classes of owl (nonterritorial males and females) have the opportunity to move at each time-step. To ensure that certain birds or areas of the map are not given preferential access to open territories or mates, the order of movement is fully randomized at each time-step.

The model allows owls to search with 'intelligence'; that is, they may favor movement through good habitat and avoid bad habitat. Similarly, females move obligately to known territorial males and non-territorial males may be averse to crossing defended territories. This intelligent behavior is modeled by giving the owls absolute knowledge of the cell that they occupy and incomplete knowledge concerning the immediately adjacent cells. They have no knowledge concerning more distant habitat. This knowledge takes the form of a series of switches and weighing factors that condition the probability of movement (table 1).

The movement controls can be broken down into four types. The first is a simple switch. In this case, if the criteria are correct, behavior is obligate. The second is a probabilistic switch. In this case, switching is performed with a certain probability if the criteria are correct: the behavior is obligate but the knowledge is not absolute. The process of females finding mates in adjacent cells, for instance, is a probabilistic switch. The logic is to simulate events such as a female being attracted by the vocalizations of a neighboring, unmated male.

The third control type takes the f orm of weighing f actors. In this case, knowledge is assumed to be absolute, but the behavior is not obligate. Vegetation characteristics affect owl behavior by weighing the likelihood that an owl will move in a particular direction. Weighing factors work in the following manner. At each time step a dispersing owl can move into one of six adjacent cells or may remain in its current cell. The probability of movement into any cell is therefore initially 1/7. This initial probability is then multiplied by each of the weighing elements. The product of all the cell probabilities times all the weighing factors is then scaled to sum to 1.0, and a cumulative distribution is created. A uniform random deviate is generated and its position in the cumulative distribution determines which choice is taken (table 2, Fig. 6).

Lastly, the model can simulate a variety of behaviors at the map edges. Three boundary conditions can be specified: absorbing, reflecting and wrap-around.

Details of Movement Parameters

The following is a detailed description of the parameters listed in table 1.

1. Become territorial. This parameter specifies the probability that a male will choose a site having a specific habitat quality as an acceptable territory. If the male becomes territorial and is located by a female, pair formation is obligate. The model is very sensitive to this parameter because it effectively sets the carrying capacity of the landscape.

2. Aversion. A weighing parameter that determines the behavior of the owl when faced with a variety of potential habitat types in the adjacent cells. Higher quality sites therefore have a greater likelihood of being selected than lower quality sites.

3. Site fidelity. A weighing parameter that influences the owl's decision to remain in the existing cell rather than to moving into adjacent cells. This parameter is similar to aversion in intent, but aversion only has an influence if there is a choice. An owl completely surrounded by poor habitat will have no criteria by which to choose and the choice will be purely random. Setting a low site fidelity to poor habitat will, however, cause the bird to move through these areas more quickly.

4. Linear propensity. Sometimes called a straightening parameter, this weighing parameter works in the f ollowing manner: Each owl has a one-move memory; the direction that was taken in the last move will be multiplied times the directional

weighing parameter. A large value will, therefore, make the owl move in a straight line. It should be noted that if the owl's last move was to stay put, the directional parameter will tend to make it stay put. This tendency can be compensated for by shifting the values of the parameter controlling site fidelity.

5. Territorial aversion. It is assumed that non-territorial males will avoid existing territories. This weighing parameter sets the degree of aversion.

6. Female finds male.

    a. Current cell. A switch - she obligately pairs.

    b. Adjacent cell. This parameter sets the probability that the female will find a male that is territorial in an adjacent cell. It is a probabilistic switch. If the value = 0, she will never find him. If the value is 1 she will always find him.

7. Boundary condition. Boundaries are treated as consisting of cells having special properties. In the case of reflecting boundaries, an owl at the map edge will have totally unsuitable land in those directions that lead off the map. When choosing a direction to move, the bird will show total aversion to the boundary and will never enter it. This method ensures that an extra move is not necessary to explore the boundary. In the case of absorbing boundaries, birds that cross the boundary are considered to be dead. In this case, the boundary is defined in terms of the adjacent cells within the map. Wrap-around boundaries can be thought of as a proxy of an open system. A bird that exits one edge re-enters on the opposite side of the map. In this case the boundary is defined in terms of the habitats that the bird will enter on the opposite side of the map.

Choosing a time-step

In this model, the probability of moving to an adjacent cell is a function of the condition of the local landscape and the biological propensities of the organism. Because transitions can occur at each time step, the number of time-steps per-year expresses an implicit rate of movement. Choosing the number of time-steps is not a casual process. Increasing the number of timesteps increases the velocity of travel. Choosing 40 steps rather than 20, for example, will double the potential number of territories that an owl can search. The critical question of scale involves the maximum possible dispersal distance before settling or death. The maximum recorded juvenile dispersal is 62 miles (100 km) (Thomas et al. 1990). If each hexagonal cell is 1000 ha in size, the distance across the cell is 1.96 miles (3.15 km). This would suggest 32 time-steps (64 miles) as possible appropriate yearly search distance. The probability of moving 64 linear miles in 32 time steps is, however, rather unlikely. In fact, in a pure random search the probability of taking 32 steps in the same direction on a hexagonal grid is almost zero (9xlO-28). The linear propensity (see above) would need to be set so high as to overwhelm all other movement considerations. The best way to determine whether a time-step is appropriate is to run the model using the desired movement parameters and compare the mean distance to death and distance to pairing produced by the model simulations to empirical data (Thomas et al. 1990:305, Table Pl).

Fledging

Fledglings here refer to those that survive to disperse. It is assumed that there are good years and bad years for fledging. If it is a good year, then the pair produces fledglings according to a beta distribution ranging from zero to a specified maximum clutch size. There are therefore two levels at which variability can impact the number of fledglings. If the area of the beta distribution is concentrated close to the mean, then the population will pulse based on the frequency of good years. When a good year occurs, all of the pairs will produce about the mean number of fledglings. If the probability of a good year is set to 1.0, then variability in the number of fledglings will be on an individual nest basis and will be dependent on the shape of the beta distribution. The form of the beta distribution can potentially be unique for each land class and age class. Because this is a two-sex model, the sex ratio of fledglings is also adjustable.

Random number generation

Because all of the model dynamics are controlled by the generation of pseudo-random numbers, it is important to test the randomness of the generator. The random number generator utilized in the model has passed a series of standard tests (Appendix).

GIS interface

The model has a module that allows the user to generate maps for purposes of display and to analyze the effects of hypothetical landscape patterns on population dynamics. In addition, an automated link has been created between the model and vector-based Geographic Information Systems (GIS) to allow integration with actual vegetation maps. Using this

link, a hexagonal grid with size appropriate to the home range of the species being modeled is intersected with the map and the area of discrete vegetation types contained within each hexagonal grid-cell is analyzed to determine habitat quality. This allows for a rapid translation of vegetation data collected on a stand-level into habitat quality on scale of individual owl home ranges. Maps generated through the GIS interface can be modified at the home-range level using the mapping facilities included in the model. Maps created by the model can also be transformed into vector-based GIS maps. This ability to move information freely between the GIS and the model allows a dynamic interaction between land management decisions and the potential impact of those decisions on owl populations. A manager can manipulate vegetation at the stand level within a GIS and evaluate the impact of those changes on owl populations. Model output such as mean pair occupancy for each cell (output as a map), based on a large number of simulations, can then be overlaid over the stand-level map to determine which stands correlate with areas displaying either high or low occupancy rates.

Results

The model was used to project population trends from five hypothetical landscapes with an identical number of suitable sites (Fig. 6-10). Other than habitat configuration, there were no dif f erences in the initial values of any model parameters. The map boundaries were wrap-around so that the exact location of the habitat within the map frame was unimportant. The demographic parameters (Table 3) were set to yield a finite growth rate of 1.0 and were not modified by habitat quality. In these simulations only two habitat qualities were simulated: habitat suitable and habitat unsuitable for nesting. The movement parameters deviated only slightly from a random walk: birds were twice as likely to choose suitable habitat, males treated occupied habitats in a manner identical to unsuitable habitat, and birds were twice as likely to move in the same direction as to choose a different direction. These deviations from random behavior were chosen so as to improve search efficiencies on all maps. Extreme aversion to poor habitat will, for instance, be beneficial in highly grouped habitats since it will effectively confine the search to those areas that are acceptable for nesting. It is, however, detrimental in very dispersed systems since, in these systems, juveniles must cross poor habitat in order to explore the landscape. Weak selectivity will be beneficial in both systems. Strong habitat selectivity in juvenile dispersal is also not supported by dispersal studies (Gutierrez et al. 1985, Miller 1989) the literature. Similarly, a small increase in the linear propensity has the primary impact of preventing useless searching caused by doubling-back.

The effects of clustering

The model results support previous model results (Doak 1989, Thomas et al. 1990, Lamberson and Noon, unpublished) in showing that a clustered structure is both more efficient in terms of mean population level and more stable in terms of lowered extinction probabilities than is a random structure. A spatial analysis of mean pair occupancy demonstrated that the small degree of stability shown by the random system occurred in the upper left-hand portion of the map where the density of suitable territories, through random chance, was highest.

The effects of shape

The shape of reserve areas also has an important impact on their stability properties. A cluster with a low edge-to-area ratio (Fig. 8) is more stable than continuous clusters with identical area but with varying degrees of irregularity. (Fig. 9-10) The population trend for the large, highly irregular cluster (Fig. 10) is similar to the system of three small clusters (Fig. 7).

Source-sink relationships

The previous results demonstrate the impact of reserve configuration when each landscape cell is either suitable or unsuitable f or breeding and the survival rates are constant f or all sites. In actual landscapes, the habitat lies along a quality gradient, from ideal to totally unsuitable. Within this gradient, there will be source locations that, on average, produce an excess of individuals and sink locations into which some of these juveniles will settle. The choice of settling point may well be globally sub-optimal (Pulliam 1991). An organism has no means to ascertain the availability of habitat except through experience and exploration. In this model, this process is simulated by varying the settling parameter. This parameter, which only applies to males (see Fig. 2), defines the probability that a bird will settle and become territorial in the site that it currently occupies. To test the effects of a reserve design embedded in a landscape that is marginally suitable to one that exists in a completely unsuitable landscape, a small reserve system was created and simulations were performed using two rule sets (Tables 3,4). All parameters were the same except for the settling rate for areas exterior to the reserve.

The presence of marginal habitat adjacent to reserves can have a negative impact on the stability of the

reserve system (Fig. 11,12). Even though the mean population size is larger in the source-sink system, the mean occupancy of the reserve clusters is lower and the variability of the system increases with time, leading to increased risks of extinction.

Discussion

An analysis of model behavior

A great deal of the behavior of any model is dictated by its structure, and this model is no exception. It is, in essence the sequel to a series of models originating with Lande's non-spatial deterministic model (Lande 1987, 1988), followed by dynamic versions in Thomas et al. (1990) and expanded in Lamberson et al. (in press) and Lamberson and Noon (unpublished ms).

This model differs from traditional stage structured population models (Begon and Mortimer, 1981; Getz and Haight, 1989) in many ways including the modeling of both reproductive and nonreproductive life history stages. In comparing a simple stage structured model with the landscape model (compare Figs. 1 and 13) pair survival differs because, in the spatial model, both members need to survive in order for the pair to survive. The probability of a pair breaking up is theref ore one minus the square of the adult or sub-adult survival rate (Fig. 1).

Flow rates between the reproductive and non-reproductive stages depend on survival rates, but movement from the nonreproductive states into the reproductive classes is mitigated by the probability of pair formation (P(p)) (Fig. 1). As P(p) -> 0, entry into the reproductive population also -> 0, and the population will decline. As P(p) -> 1, the non-reproductive vector empties and the model collapses into the reproductive classes. P(p) is the parameter through which spatial relationships impact the life history of the organism.

P(p) is closely related to the probability of finding a suitable site. For males, a suitable site is defined by the cell's quality and occupancy status. For females, suitability is defined by the presence of a territorial male. Even though the criteria are different, the search process is similar.

In an unconstrained random walk, and allowing a fixed number of cells to be searched, the probability of searching a cell declines rapidly with distance from the point of origin (Fig. 14). If the total number of cells searched is increased, the probability of searching a cell increases slowly and asymptotically (Fig. 15). For this reason, distance dominates search probabilities (Fig. 15,16). The model is, therefore, reasonably insensitive to changes in search velocity and extremely sensitive to the spatial positions of the reproductive pairs in the landscape.

In the model, birds search with a fixed survival probability, rather than searching a fixed number of times as has been the case in other models (Lande 1987, Thomas et al. 1990, Lamberson et al. in press, Lamberson and Noon unpublished). This difference, however, is unimportant to the model dynamics: equivalent search functions can be generated using either approach (Fig. 17).

P(p) will decline if the population is high, because unoccupied sites will be scarce and will tend to lie in areas that are distant from large groups of reproductive pairs. P(p) will also decline if the population levels are low, because searching females will have difficulty finding territorial males. P(p) will decline as the population becomes more diffuse. As a result, any actions that cause the mean distance between reproductive pairs to increase will therefore always impact the finite rate of increase of the population.

Model behavior at high population levels is qualitatively similar to a logistic model. At low densities, however, the models diverge. The logistic model assumes that population response will be most robust (the ratio of birth/death will be largest) when the population is depressed. If search is explicitly modeled, there are positive benefits associated with density. When the density drops in the context of abundant habitat, territorial males may go unpaired due to the low density of females: females will not locate males and form pairs before they die. If, in addition, low population densities are associated with long distances between potential territories, as is the case when habitat is fragmented, then the ability of the males to find territories will be reduced as well. This model, and all of the models following Lande (1987) will therefore have threshold points defined by population density and degree of habitat fragmentation at which the population will collapse. Population instability has sometimes been introduced into traditional models by incorporating an 'Allee effect' (Allee 1931; Noy-Meir 1975), but the correct functional form and strength of this effect is not clear. In this model, the 'Allee eff6ctl occurs naturally as a direct result of search.

Fecundity

The population birth rate B is also affected by costs associated with search:

$$B = b * P(m) \tag{2}$$

$$P(m) + f(s,e,P(p)) \tag{3}$$

where

B is the population birth rate,
b is the measured birth rate for paired females,
P(m) is the probability that a female has a mate, and s is the adult survival rate.

P(m), represents the balance between pair break-up and pair formation. Pair break-up is a function of the adult survival rate which is based on site quality, and is assumed to be density independent (the presence or absence of adults on the same site or in adjacent sites has no impact on the parameter value) . The rate of pair formation is controlled by P(p).

If b is constant, then B will simply follow P(p). It is this decline in B that causes diffuse populations to collapse (Fig. 6) even when there are no decreases in survival probability associated with search.

Questions of scale

Fragmentation has the impact of altering phenomenon which are dependent on contagion. Contagion can have effects that are either positive or negative. The success of females searching for territorial males is positively af f ected by contagion. The negative consequences associated with disease or the spread of fire are also dependent on contagion. Fragmentation is not, therefore, negative per-se. Its consequences, good or bad, are solely dependent on the extent to which it affects various contagion-related phenomena. Contagion phenomena will always be scale dependent - and these dependencies will be rooted in the biological and physical properties of the phenomenon. Fire, for instance, can be effectively stopped by a rather narrow fire break. This fire break may have absolutely no impact on the dispersal efficiency of a large raptor, but may represent an absolute barrier to a salamander. Similarly, a disease that depends on direct transmittal could easily be controlled by producing a f ragmentation pattern that separated the members of the species in question. If, however, the disease were vectored through a prey item, then f ragmenting the system would only be an ef f ective method of disease control if it reduced the encounter rate between the predator and its infected prey.

When modeling spatial phenomenon, it is necessary to choose an explicit spatial scale at which to model. Smaller scales will need to be implicitly modeled through indices - and these indices may, themselves be scale dependent. In this model, each home-range-sized polygon is given a quality index, and this index is in turn linked to fitness values. For modeling the spotted owl, the explicit scaling is very large (1000 ha) - based on the average size of individual owl home ranges. The fragmentation of vegetation on the landscape, however, is on the order the size of timber sale units (about 10 ha). If, for example, the quality index for a home range were based on the acreage of suitable habitat within the home range, all spatial patterning below the size of the home range would be ignored by the mode 1. Any home range with 50% owl habitat will be modeled as being of equivalent quality (equal values for mortality, aversion, etc.) regardless of the pattern of the remaining habitat within the home range. If spatial patterns within the home range are thought to be important, then they must be incorporated into the home range quality index through the use of spatial statistics such as average patch size or fractal dimension. Because fragmentation is only explicitly modeled at the broadest scale, fragmentation at lower scales may have impacts both positive and negative that are not represented by model behavior.

Territories as islands

Territories can be thought of as small islands, each having a maximum of one reproducing pair. Like islands, they have spatial dimension - they occupy a certain area of the map. And, like islands, when they experience local extinction (in this case one or both members of the pair either dies or emigrates), they must be recolonized through immigration from owls outside the territory or by an existing,, non-territorial lfloaterl population within the territory.

The concept of territories as individual islands is key to the dynamics of clusters in the model. Larger reserves can be thought of as an archipelago in which all of the islands are very close to one another. Fragmenting the landscape has the effect of moving the islands further apart.

The loss of a reproducing pair is, in effect, a local extinction. The rate of recolonization of an individual territory will be dependent on the spatial arrangement of the habitats and the fecundity of the reproducing pairs; that is, how many individuals are looking for territories or mates and the likelihood they will find the site in question.

Typical yearly adult survival for spotted owl adults ranges between 0.81-0.92 (Thomas et al. 1990: 230-231). The pair survival rate (both members survive) will therefore range from 0.72 to 0.84. When the probability of search by dispersing juveniles falls below the pair survival rate, juvenile dispersal mechanisms will not be sufficient to maintain the population of pairs at their habitatbased carrying capacity. The system will

become dependent on recolonization by non-territorial adult lfloaters, that are already on-site. As pairs are lost due to local extinction, this will increase the distance between reproductive pairs, further increasing the disparity between extinction and colonization rates. In the absence of a balance between the rates of pair loss and reestablishment, the population will unavoidably tumble towards extinction.

The role of clusters

From a modeling standpoint, a system of clusters is more stable than a diffuse system because the clusters produce regions where search efficiency is maximized. In a cluster of suitable territories, a population can recover from low levels because P(p) will remain high. That is, because all of the remaining members of the population remain close, the impacts on P(p) are minimized and the model behaves like a traditional population model, exhibiting positive growth rates when occupancy is reduced. Dispersing males have a high probability of finding habitats immediately adjacent to existing pairs. Dispersing females will more easily find the territorial males because of their adjacency. The key to successful clusters is clearly to make the clusters large enough to avoid high levels of extinction at the cluster level. In practice this means that each cluster's carrying capacity should be large enough that normal population declines driven by environmental and demographic stochasticity do not drive the population down to levels at which random extinction is likely. Looking only at demographic stochasticity, this would suggest a minimum cluster population size of approximately 20 breeding pairs (Richter-Dyn and Goel 1972).

The effect of shape

The negative impacts caused by cluster irregularity are also due to habitat search. A circular cluster of suitable habitat minimizes the distance between clusters. All other geometric forms will have reduced P(p) when compared with the a circular cluster. The impact of cluster irregularity are, in fact, probably more pronounced than is indicated by figures 8-10. In these simulations, the risks associated with crossing poor quality habitat were identical to those encountered in suitable habitat. If greater risks were encountered in the poor habitat, the effects of irregular,cluster shape of would be accentuated.

Source-sink dynamics

The increase in variance that is observed in systems containing marginal habitat for nesting (Fig. 12) is due primarily to the increased variance in adult survival rates. If nesting is restricted to the clusters, the population will equilibrate with a relatively constant proportion of the adult population within the clusters and dispersing through the matrix. Changes in the population vital rates will, therefore, be bounded by the levels of environmental and demographic stochasticity, and population variability will remain reasonably constant over time.

When breeding occurs exterior to the clusters, the population becomes more dynamic. Both the vital rates and the spatial configuration of the population will be dependent on the proportion of the population that exists exterior to the reserve structure. If a large number of the breeding pairs lie exterior to the reserve, not only will the overall survival rates decline, but the system will also become diffuse, lowering P(p). The bounds on the population growth rates will therefore be set by both the proportion of the breeding population found exterior to the reserve and the levels of environmental and demographic stochasticity. Because the model runs are begun with all of the birds within the reserve structure, variability increases over time (Fig. 12).

The decline in mean occupancy levels in the source-sink system is due to decreased interaction between clusters. Dispersing juveniles that settle exterior to the reserve would, if this option were not available, continue searching and some of them would become pairs within the clusters. This outcome suggests that a reserve design may be more stable if the boundaries between the reserve and the surrounding landscape are very distinct. Maintenance of sink areas exterior to the reserve system may lead to sub-optimal choices on the part of dispersing juveniles.

Summary

A model containing explicit links to landscape vegetation patterns was created. Its results are consistent with previous models based on search efficiency (Lande 1987, 1988, Doak 1989, Thomas et al. 1990). An analysis of the model structure demonstrates that this model form will favor clumped reserve structures over diffuse structures due to the inherent geometric properties of the search function. The model results and subsequent analysis indicate that land management policies that increase fragmentation are extremely detrimental to territorial populations because the uncertainties of successful search cause the population dynamics in reduced populations to experience reduced rates of territory recolonization. Low population levels in fragmented systems will not, therefore, exhibit the strong upward population pressure inherent in traditional density-dependent models.

Recovery will be slow and difficult and, at a specific level of fragmentation, impossible.

Negative impacts associated with fragmentation can be mitigated by clustering reserves. Clusters will display greater search efficiencies and will be more stable than a random diffuse system with equal acreage in suitable habitat.

In addition to supporting these general conclusions, this model extends the capabilities of previous models through its ability to directly model the irregular and patchy habitat configurations found in real landscapes. It also allows f or a gradient of habitat quality and ties risk and movement rules directly to that gradient. These properties allow owl demographics to be based directly on map information held in GIS systems, and allows the modeling of populations in spatially dynamic landscapes.

Model Implementation: The BLM in Oregon

Parameterizing the Model:

All of the landscapes used up to this point have been hypothetical. In order to link the model to actual landscapes, links must be made between the configuration of the landscape and its quality as owl habitat. Because the this linkage is performed through the use of a GIS database, the landscape attributes must be chosen from those available within the GIS. In order to facilitate this process, Jon Bart, chairman of the Northern Spotted owl Recovery Team, looked to the available data to determine those habitat attributes that were linked to specific demographic information. The attribute that best correlated with survival, fecundity, and nest density of owls was the amount of mature forest within a region of the map surrounding the owl nest-site. For modeling purposes we translated this into the proportion of mature forest within a home-range-sized area, a hexagonal area 1000 ha in size.

Dr. Bart drew together the available data and constructed functions for survival and fecundity and the probability of nesting based on the amount of mature forest in a home-range-sized area. These relationships were discussed at a series of meetings with a group of biologists employed by the Forest Service, Bureau of Land Management, and private industry.

our purpose was to utilize these parameters, in conjunction with projected management plans, to look at future forest conditions and to evaluate the efficacy of those plans in terms of the maintenance of owl populations. our primary purpose was comparative: we wished to evaluate and ordinally rank the management plans, not to attempt to predict the number of owls within the landscape in 100 years. There are enormous uncertainties concerning the reliability of the habitat relationships, the recovery time f or stands that are cut, and patterns of land utilization on those lands not controlled by the *BIM.* The model results should therefore be interpreted conditionally: given that the tree growth rates, habitat relationships and owl behavior patterns occur exactly as specif ied, the plans produce the following number of owls in the following locations 100 years into the future.

Because of these uncertainties, we ran the model for each management alternative using 3 sets of parameters. Each was based on Dr. Bart's original parameters (Table 5, Fig. 18), but the parameters were shifted: In the second set, the parameters associated with >60% mature forest also were true for cells with 40-60%. In the third set, these parameters were true for stands having >30% suitable habitat. All other parameters were similarly shifted (Fig. 19). This shifting, in effect, changed the evaluation of the landscape, but did not change the behavior of the owls within habitat of a specific quality. Viewing the landscape as a system of sources and sinks, in Dr. Bart's rule set only homerange areas with > 60% mature forest are considered sources. In the second rule set Home range areas with >40% mature forest are sources, and in the third set home-range areas with >30% mature forest are sources. Dr. Bart's original rule set will therefore produce the lowest number of owls. The other two model runs are less pessimistic.

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Appendix

1. Moments. The first, second and third moments for a uniform random distribution should be 1/2, 1/3, and 1/4 respectively. Typical output for n = 1,000,000 are 0.5002, 0.3335, 0.2501 respectively.

2. Uniformity. In this test random numbers are generated and cast into a series of bins, based on their value. This test was run with 100 bins and a Chi-Square test was performed against the assumption that all bins would be equal in value. Typical values for n = 1,000,000 are < 1.0; The 0.05 critical value is approximately 120.

3. Pairs. This test looks at f irst order sequential correlation. Sequential pairs of random numbers are produced and binned based on their value. Ideally, all pairs should be produced with equal frequency. In this case the pairs were binned into a 10xlO matrix. A ChiSquare test was performed against the assumption that all matrix elements are equal in value. Typical values for n = 1,000,000 were < 2.0. Again, the 0.05 critical value is approximately 120.

4. Runs. This test looks at the overall degree of sequential correlation between random numbers generated. In this test, random numbers between 0 and 1 are generated and are rounded to 0 or 1 based on their value. As these numbers are produced they are grouped into 'runs'. 00010, for instance would have a run of 3 and two runs of 1. The run lengths are collected and, after a large number of random numbers has been produced the question is asked: is the population of runs generated significantly different than would be expected based on the binomial distribution. Here again, a ChiSquare test of f it was used to test for runs <= 30 elements in length. Typical values f or n = 1, 000, 000 ranged from 15-20. The 0.05 critical value is 41.3.

5. Period. All random number generators produce pseudorandom numbers in a deterministic cycle of finite length. The period of a random number generator refers to the length of the cycle. To test for the period, the random number generator is 'seeded' with a value and then is looped to produce random deviates until the 'seed' value is reproduced. The maximum period for a generator is, therefore, determined by the number of bits set aside to hold the seed, but may be less if the generator is improperly constructed. For the generator used in the model, the number of bits = 32, and the observed period is 2 32 = 4.3 billion. other tests can be run, but based on these results, there is no reason to assume that any non-random characteristics of the random number generator will have a significant effect on the model performance.

Table 1. A summary of factors that can affect an individual's movement in the model.

Factor	Based on	Sex	Form
Become Territorial	Habitat Quality/Occupancy	M	Probabilistic Switch
Aversion	Habitat Quality	M/F	Weighting
Site Fidelity	Habitat Quality	M/F	Weighting
Linear Propensity	Behavior	M/F	Weighting
Territorial Aversion	Occupancy	M	Weighting
Female Finds Male (Current Cell)	Occupancy	F	Absolute Switch
Female Finds Male (Adjacent Cell)	Occupancy	F	Probabilistic Switch
Global Boundary	—	M/F	—

Table 2. An example of the process used to determine movement in a heterogeneous landscape. If 0.448 were generated randomly, then direction 4 would be chosen. Direction 3 is never chosen.

Direction	The initial vector	Weighing factor	Scaled vector	Cumulative Probability
1	0.143	0.900	0.143	0.143
2	0.143	0.600	0.095	0.238
3	0.143	0.000	0.000	0.238
4	0.143	1.000	0.159	0.397
5	0.143	1.000	0.159	0.556
6	0.143	1.900	0.302	0.857
7	0.143	0.900	0.129	1.000

Table 3. List of the parameter values used for the simulations. Parameters were chosen to produce as optimistic an estimate of owl survival as could be supported by these data. Parameters only varied with site quality where explicitly stated.

Parameter	Value	Source
Juvenile survival	0.29	Franklin et al. 1990
Sub-adult survival	0.935	Thomas et al. iggo
Adult Survival	0.935	Thomas et al. 1990
Birth rate	0.335	Franklin et al. 1990
Aversion	1.0, 0.5[1]	
Boundary	Wrap-around	
Linear propensity	2.0	
Site fidelity	0.5	
Territorial aversion	0.5	
Female finds male	0.5	
Time-steps	40	
Runs	30	

[1]Only two habitat types were placed in the map, one representing the best habitat and the other representing the worst. This split corresponds to suitable/ unsuitable designations found in past models.

Table 4. List of the parameter values used for the cells exterior to the habitat reserve (Fig. 11, 12) . Parameters within the reserve, as well as general parameters that pertain to all cells are presented in Table 3. Parameters are those calculated for measured a demographic study, Roseburg, Oregon.

Parameter	Value	Source
Juvenile survival	0.219	Thomas et al. 1990
Sub-adult survival	0.588	Thomas et al. 1990
Adult Survival	0.812	Thomas et al. 1990
Birth rate	0.310	Thomas et al. 1990

Table 5. Rule set used for simulation of BLM management alternatives. Values for sub-adult and adult survival, and probabilities of pair formation are based on values derived by Dr. John Bart.

	Land Classification (percent)				
	<20	20-30	30-40	40-60	>60
Survival					
Juvenile	0.20	0.29	0.29	0.29	0.29
Sub-adult	0.38	0.38	0.41	0.45	0.50
Adult	0.75	0.76	0.82	9.90	9.96
Fecundity					
Adult	0.00	0.34	0.34	0.34	0.34
Movement					
Nesting prob.	0.13	0.40	0.55	0.83	1.00
Aversion	0.30	0.50	0.70	0.90	1.00
λ					
Non-breeding	0.75	0.76	0.82	0.90	0.96
Breeding	0.75	0.80	0.87	0.94	1.01

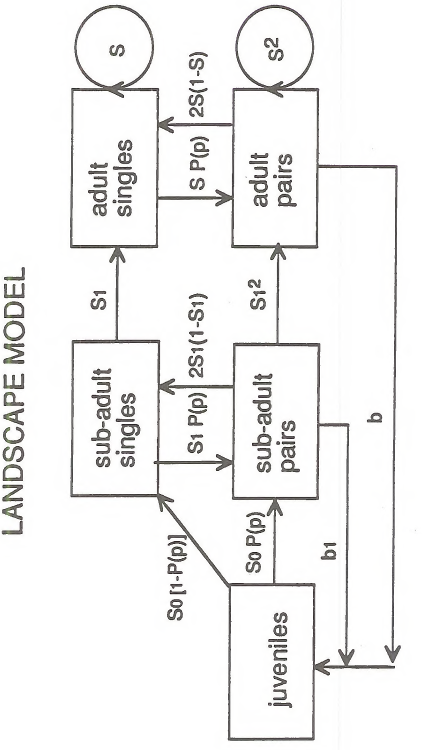


Figure 1. *Flow diagram of the life history structure used in the landscape model. P(p) is the probability of pairing.*

MALE MOVEMENT

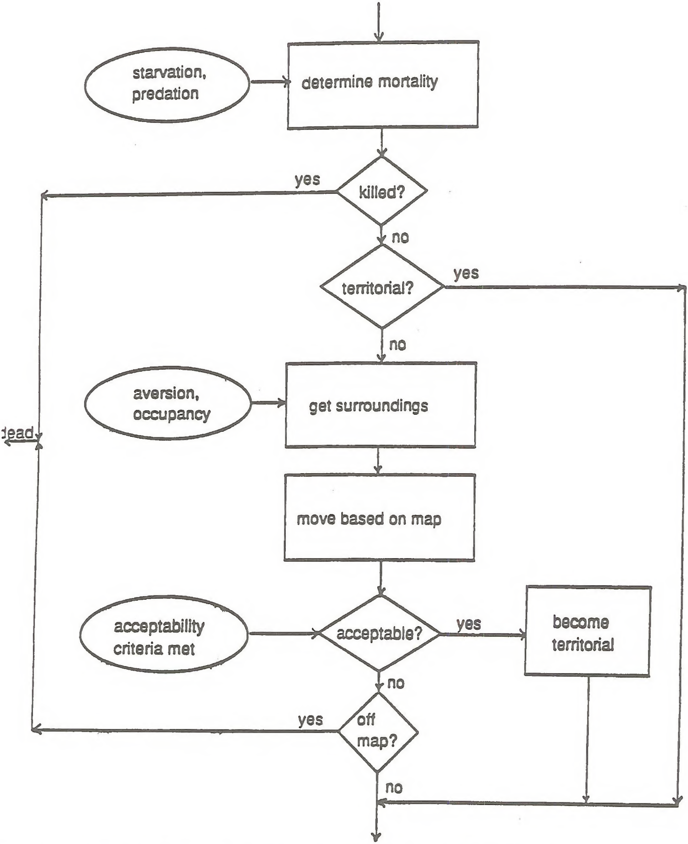


Figure 2. Flow diagram representing the process f or determining male behavior at each time step in the model.

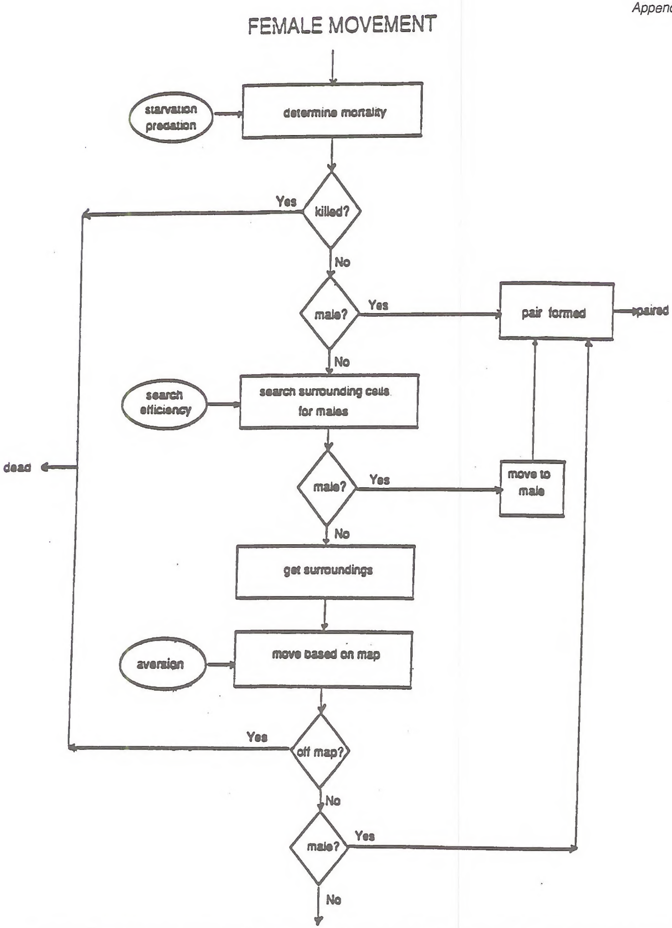


Figure 3. Flow diagram representing the process f or determining female behavior at each time step in the model.

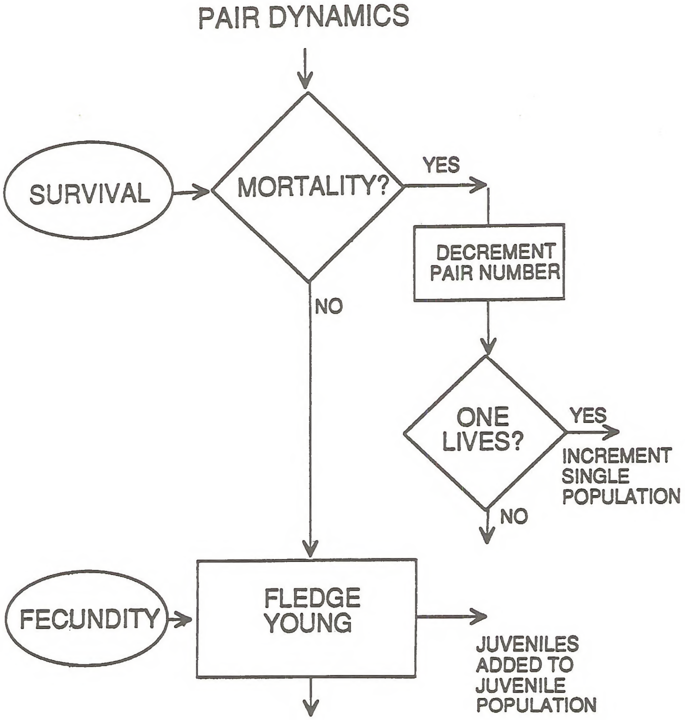


Figure 4. *Flow diagram representing yearly pair dynamics. Pairs only remain reproductive if both members survive.*

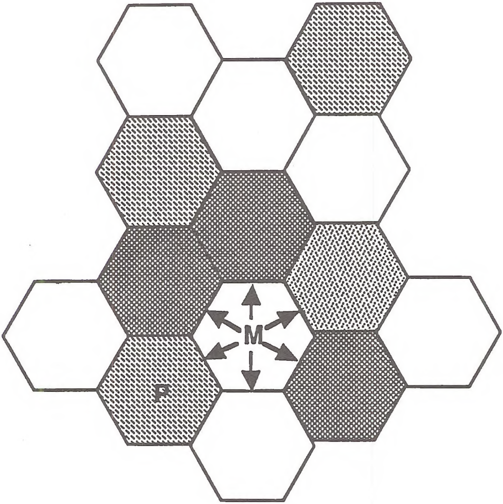
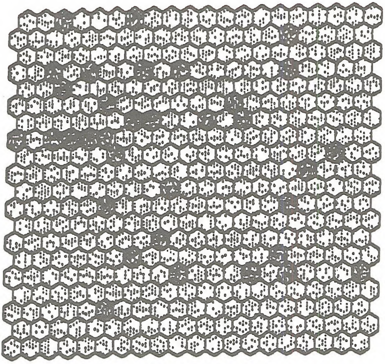


Figure 5. The arrows represent the potential choices for a male in a heterogeneous landscape. The move will be based on a probability vector conditioned by the different qualities of the choices.



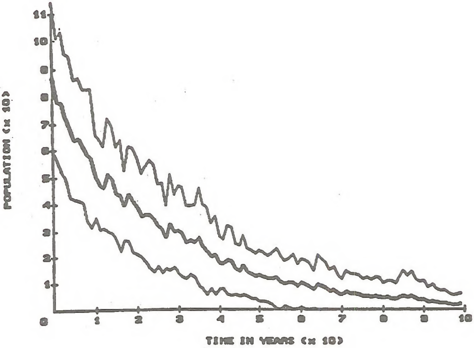
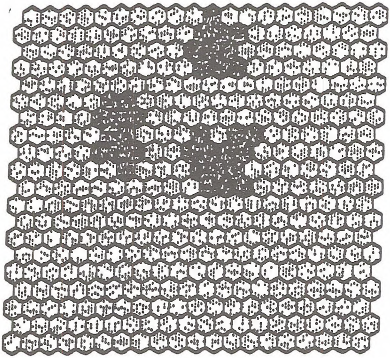


Figure 6. Model simulation showing a simulated landscape with suitable habitat randomly scattered. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.



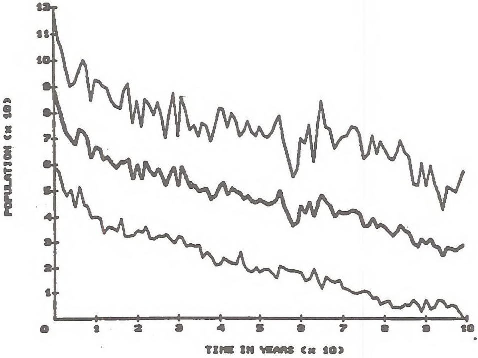


Figure 7. Model simulation showing a simulated landscape with suitable habitat arrayed in three small blocks. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

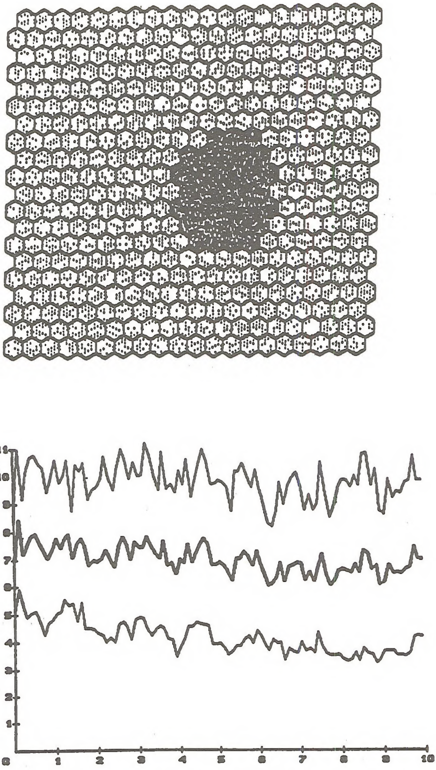
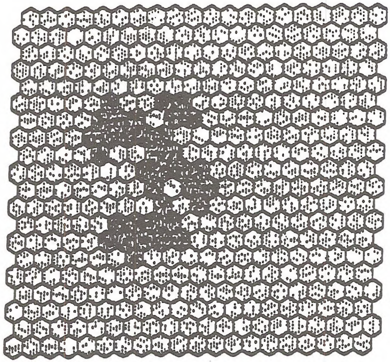


__Figure 8.__ Model simulation showing a simulated landscape with suitable habitat arrayed in one large regular block. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.



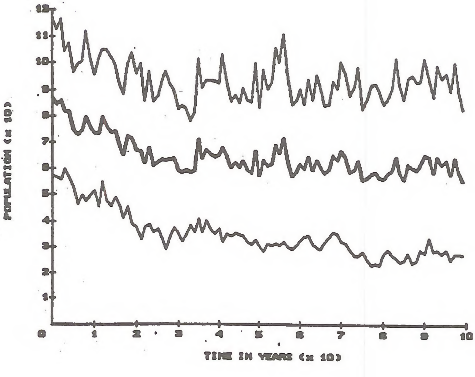


Figure 9. *Model simulation showing a simulated landscape with suitable habitat arrayed in one large irregular block. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.*

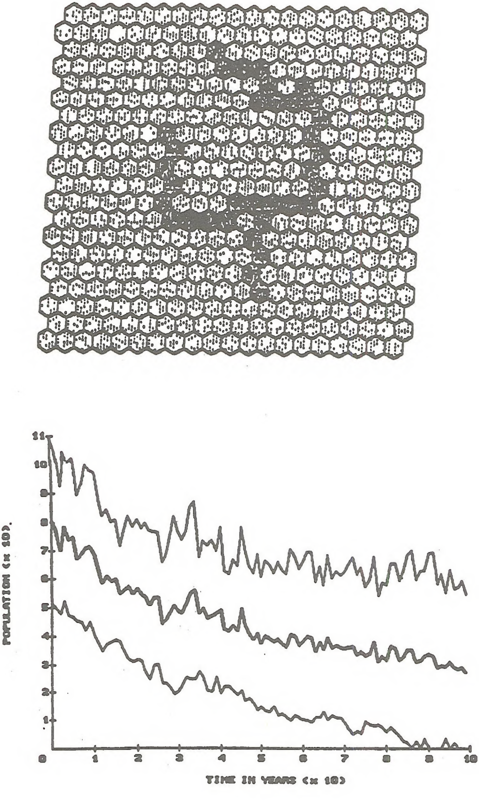


Figure 10. Model simulation showing a simulated landscape with suitable habitat arrayed in one very irregular block. this block is similar in form to reserves that consist of riparian corridors. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

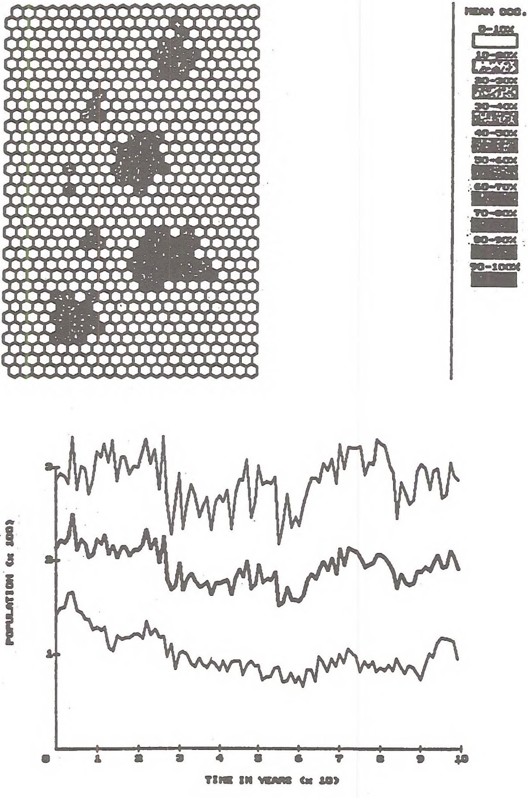


Figure 11. Model simulation showing a simulated landscape with suitable habitat with a reserve system consisting of clusters of suitable habitat surrounded by unsuitable habitat. The population was initialized results are based on 30 simulations. Mean occupancy is the proportion of the time that pairs occupied the site. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

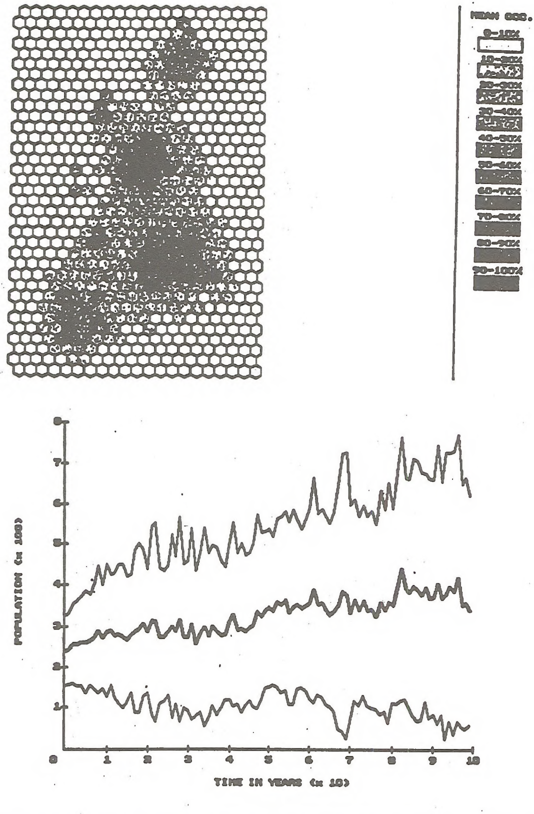


Figure 12. Model simulation showing a simulated landscape with suitable habitat with a reserve system consisting of clusters of suitable habitat surrounded by marginal habitat. The population was initialized results are based on 30 simulations. Mean occupancy is the proportion of the time that pairs occupied the site. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

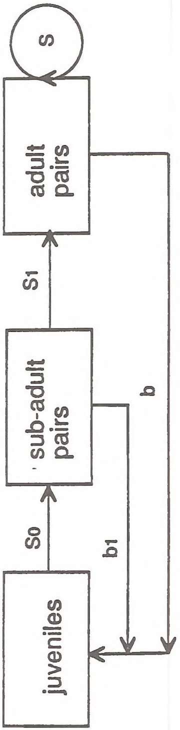


Figure 13. *A flow diagram representing the life history structure used in s linear stage-structured matrix model.*

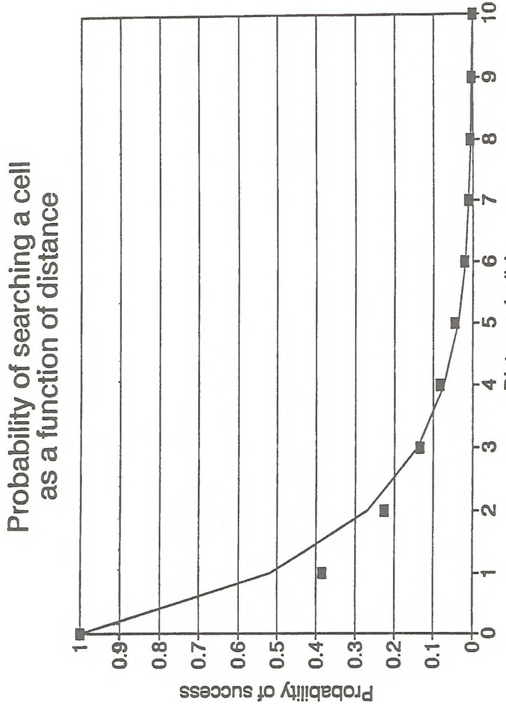


Figure 14. *The probability that an organism searches a cell given 20 searches. The search pattern is a pure random walk. The line is a best-fit exponential function.*

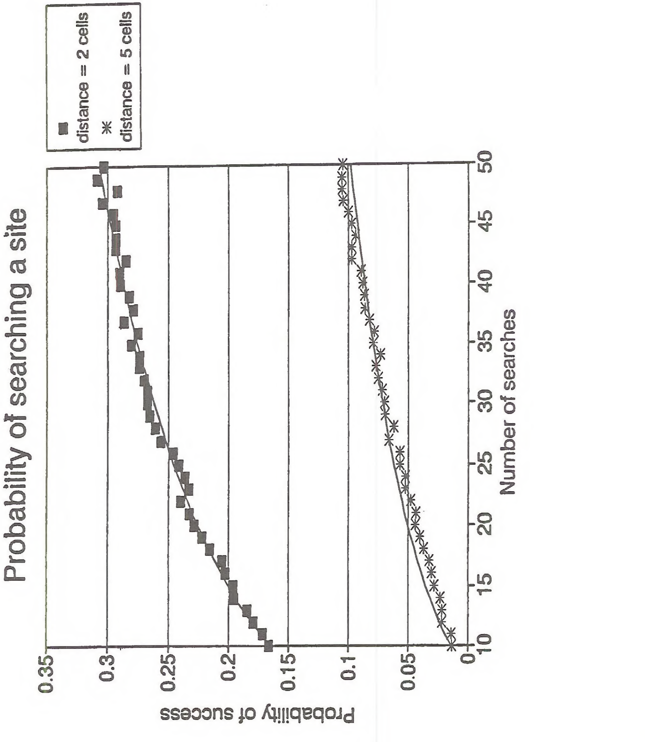


Figure 15. *The probability of searching a site, changing the number of searches. The probability of searching a site 2 cells away is greater given 10 searches than the probability of searching a site 5 cells away is given 50 searches.*

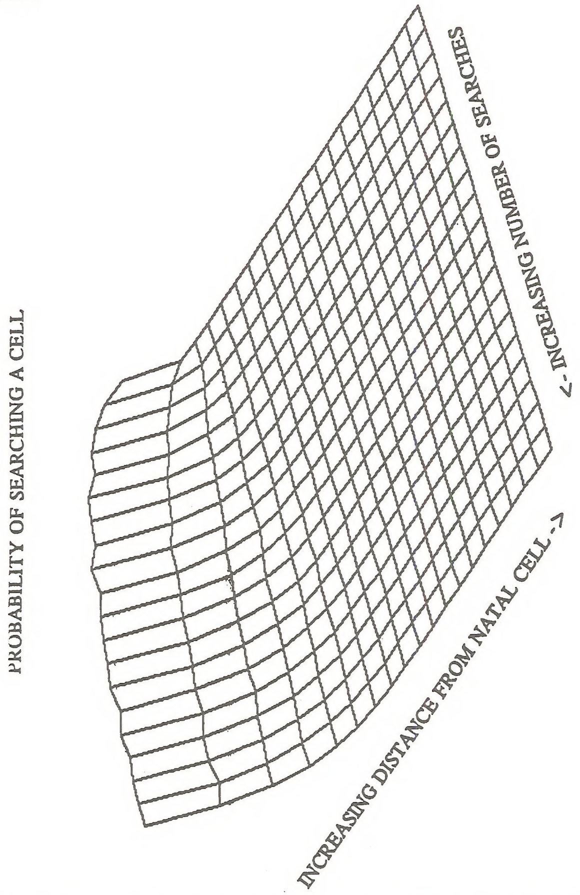


Figure 16. *A three-dimensional representation of the probability of searching a cell. Distance from the natal cell dominates the probability function.*

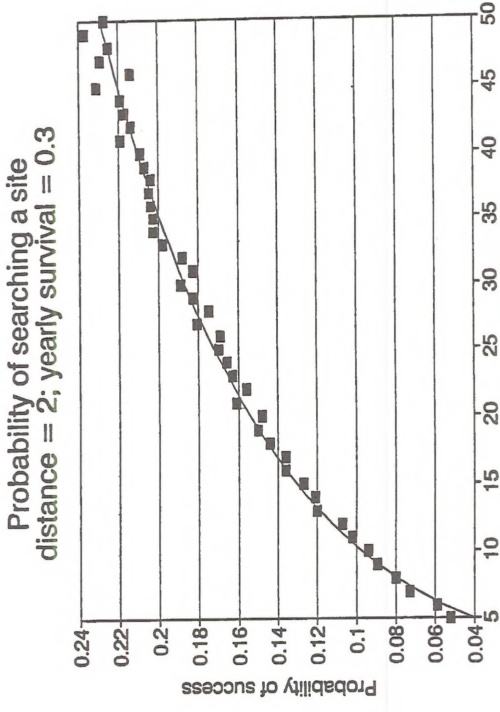


Figure 17. *The probability of searching a site with constant mortality. Here, the yearly risk is pro-rated across the number of steps-per-year. The bird searches until the target cell is found or the bird dies.*

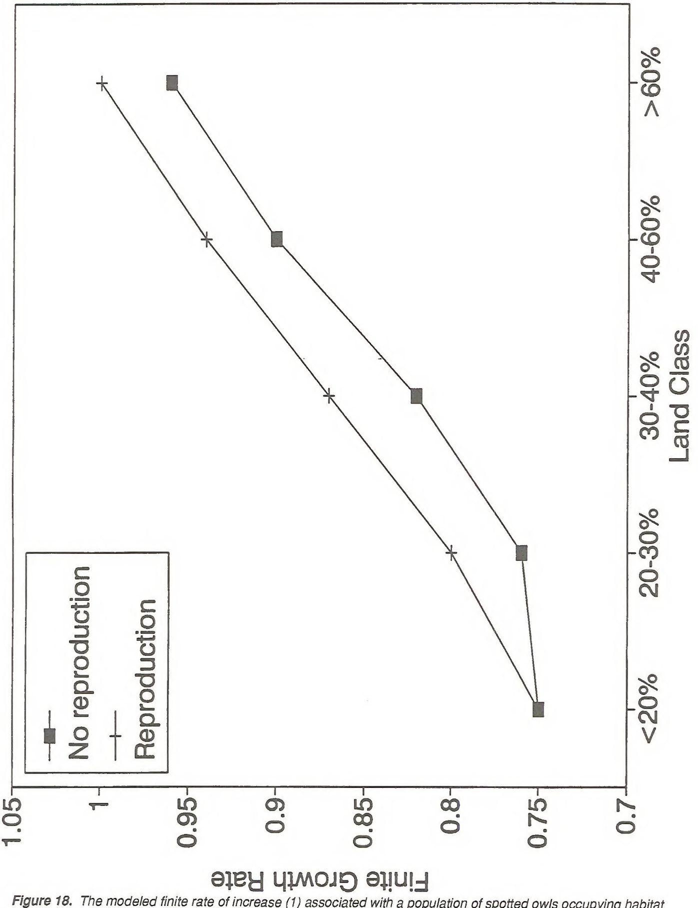


Figure 18. *The modeled finite rate of increase (1) associated with a population of spotted owls occupying habitat having varying percentages of mature forest. Values derived from parameters presented in Table 5.*

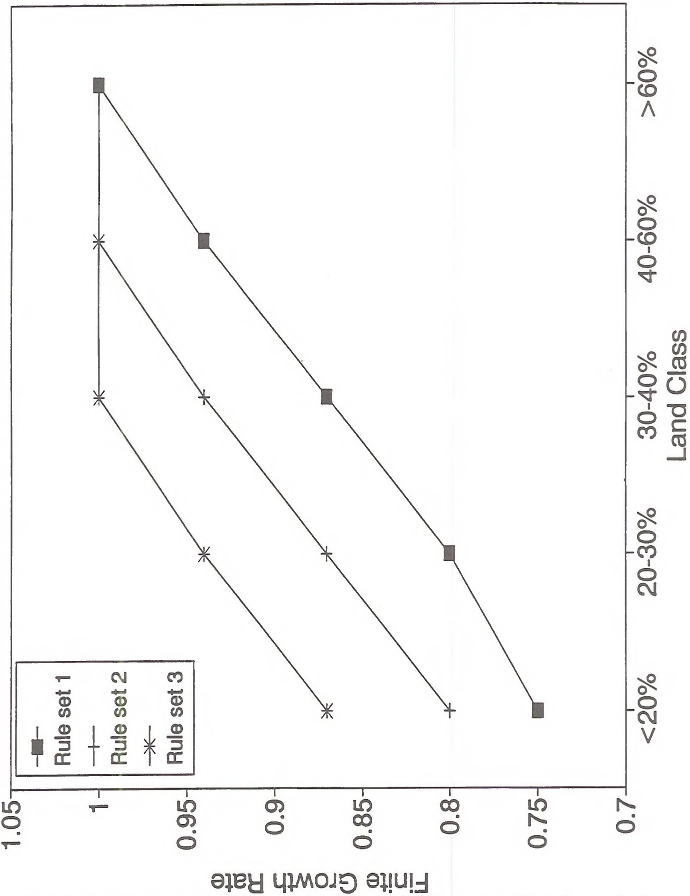


Figure 19. *Modeled l associated with habitat quality. Rule set 3 shows the least sensitivity to the quantity of suitable habitat on the landscape.*

Appendix 4-J
Possible Management Activities and Major Consequences in Existing and Potential Special Areas

Special Area	Alt.	Possible Management Activities/Major Consequences
Existing		
Big Canyon ACEC/ONA	NA	High potential for energy and minerals occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/ONA. Consequences: natural values could be lost or damaged if mineral activity occurs.
	A	65 acres of timber harvest included in the 10-year scenario; high potential for energy and minerals occurrence; available for road construction, off-road vehicle use, etc. Consequences: natural values could be lost or damaged.
	B-E	No commodity development activities due to continued designation as an ACEC/ONA and proposal to control surface mineral activity; some additional protection in the surrounding area due to 35 percent basal area retention (alt. C) and VRM II (alt. E). Consequences: natural values would be protected.
	PA	Natural values partially protected by fragile site classification and riparian management area allocation; high potential for energy and minerals occurrence. Consequences: may be some unintentional damage to natural values due to timber blow down following harvest of adjacent areas; values could be lost or damaged if energy and mineral development occurs.
Carolyn's Crown ACEC/RNA	NA	High potential for minerals occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/ONA. Consequences: natural values could be lost or damaged if mineral activity occurs.
	A	49 acres of timber harvest included in the 10-year scenario; high potential for minerals development; available for road construction, off-road vehicle use, etc. Consequences: natural values would be lost.
	B-E, PA	No commodity development activities due to continued designation as an ACEC/RNA and proposal to control surface mineral activity; some additional protection in the surrounding area due to R&R block and 35 percent basal area retention (alt. C), HCA (alt. D), habitat protection allocation (alt. E) and OGEA-1 (PA). Consequences: Natural values would be protected.
Elk Creek ACEC	NA	Moderate potential for mineral occurrence; continued designation as an ACEC; no timber harvest in primary habitat; timber harvest would occur in secondary habitat; other uses controlled. Consequences: wildlife values could be lost if mineral development occurs.
	A, B	Primary bald eagle habitat protected by critical habitat designation (alt. A), by ACEC designation (alt. B) and by proposal to control surface mineral activity; timber harvest would occur in secondary habitat (587 acres in alt. A and 330 acres in alt. B); other uses controlled. Consequences: wildlife values minimally protected.
	C	Primary habitat protected by ACEC designation and proposal to control surface mineral activity; secondary habitat partially protected by R&R block and 35 percent basal area retention. Consequences: wildlife values protected.
	D	No commodity development activities in primary or secondary habitat due to HCA allocation and proposal to control surface mineral activity. Consequences: wildlife values fully protected.

	E	Primary and secondary habitat protected by ACEC designation and proposal to control surface mineral activity. Consequences: wildlife values fully protected.
	PA	Primary habitat protected by ACEC designation and proposal to control surface mineral activity; secondary habitat managed as part of OGEA-2 (150-year timber harvest rotation). Consequences: wildlife values protected.
Grass Mountain ACEC/RNA	NA	Moderate potential for energy occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/RNA. Consequences: natural values could be lost or damaged if mineral activity occurs.
	A	34 acres of timber harvest included in the 10-year scenario; moderate potential for energy occurrence; grass bald available for road construction, off-road vehicle use, etc. Consequences: botanical values would be lost or damaged.
	B-E, PA	No commodity development activities due to continued designation as an ACEC/ RNA and proposal to control surface mineral activity; some additional protection in surrounding area due to R&R block (alt. C), HCA (alt. D) and OGEA-1 (PA). Consequences: botanical values would be protected.
High Pk.-Moon Cr. ACEC/RNA	NA	Moderate potential for energy occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/RNA. Consequences: natural values could be lost or damaged if energy development occurs.
	A	871 acres of timber harvest included in the 10-year scenario; moderate potential for energy; available for road construction, off-road vehicle use, etc. Consequences: natural values would be lost or damaged.
	B-E, PA	No commodity development activities due to continued designation as an ACEC/ RNA and proposal to control surface mineral activity; some additional protection in surrounding area due to R&R block and 35 percent basal area retention (alt. C), HCA (alt. D) and OGEA-2 (PA). Consequences: Natural values would be protected.
Larch Mtn. Env. Education Site	NA	Allocated as env. educ. site but available for timber harvest, mineral entry, etc.; moderate potential for energy occurrence. Consequences: educational values could be lost or damaged if harvest or mineral development occurs.
	A	No acres of timber harvest included in the 10-year scenario but timber could be harvested in the future; moderate potential for energy occurrence; available for road construction, off-road vehicle use, etc. Consequences: natural values would be lost or damaged if timber harvest or energy development occurs.
	B-E, PA	No commodity development activities due to continued designation as an env. educ. site and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C), VRM II (alt. D) and habitat protection allocation (alt. E). Consequences: natural values would be protected.
Little Grass Mtn. ACEC/ONA	NA	Moderate potential for energy occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/ONA. Consequences: natural values could be lost or damaged if energy development occurs.
	A	14 acres of timber harvest included in the 10-year scenario; moderate potential for energy occurrence; available for road construction, off-road vehicle use, etc. Consequences: natural values would be lost or damaged if timber harvest or energy development occurs.
	B-E, PA	No commodity development activities due to continued designation as an ACEC/ ONA and proposal to control surface mineral activity; some additional protection

		in surrounding area due to 35 percent basal area retention (alt. C), HCA (alt. D), habitat protection allocation (alt. E) and OGEA-1 (PA). Consequences: natural values would be protected.
Little Sink ACEC/ONA	A	No commodity development activities due to interim protection as an instant wilderness study area; congressional decision could open part of the area for development, but fragile areas would not be disturbed. Consequences: natural values protected pending congressional decision.
	NA, B-E, PA	No commodity development activities due to continued mineral withdrawal and designation as an ACEC/RNA; some additional protection in surrounding area due to 35 percent basal area retention (alt. C). Consequences: natural values would be protected.
Lost Prairie ACEC	NA	Moderate potential for energy occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/ONA. Consequences: botanical values could be lost or damaged if energy development occurs.
	A	No acres of timber harvest included in the 10-year scenario; could possibly be reforested and harvested in the future; moderate potential for energy occurrence; available for road construction, off-road vehicle use, etc. Consequences: botanical values would be lost or damaged.
	B-E, PA	No commodity development activities due to continued designation as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C) and connectivity area - 1 (PA). Consequences: botanical values would be protected.
Mary's Peak ACEC/ONA	NA	Moderate potential for energy and mineral occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/ONA. Consequences: botanical values could be lost or damaged if energy and mineral development occurs.
	A	10 acres of timber harvest included in the 10-year scenario; moderate potential for energy and minerals occurrence; available for road construction, off-road vehicle use, etc. Consequences: botanical values would be lost or damaged if timber harvest or energy and mineral development occurs.
	B-E, PA	No commodity development activities due to continued designation as an ACEC/ONA and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C), HCA (alt. D), habitat protection allocation (alt. E) and OGEA - 1 (PA). Consequences: botanical values would be protected.
Middle Santiam Terrace ACEC	NA	Moderate potential for mineral occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/ONA. Consequences: natural values could be lost or damaged if mineral development occurs.
	A	Area available for timber harvest; moderate potential for mineral occurrence; available for road construction, off-road vehicle use, etc. Consequences: natural values lost or damaged.
	B-E, PA	No commodity development activities due to continued designation as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C), habitat protection allocation (alt. E) and OGEA-3 (PA). Consequences: natural values would be protected.
Nestucca River	A	1,423 acres of timber harvest included in the 10-year scenario; closed to mineral development on the surface; available for road construction, off-road vehicle use, etc. Consequences: narrow riparian buffer (75 feet) would not provide adequate protection for recreation, visual and fishery values.

Nestucca R. (cont.)	B, NA	No commodity development in primary zone; timber harvest planned in secondary zone (710 acres in 10-year scenario for alternative B). Consequences: activity in the secondary zone could have adverse impacts on recreation, visual and fishery values in the primary zone.
	C	Same as B and NA except 35 percent basal area retention would provide some additional protection in the lower part of the ACEC. Consequences: similar to B and NA.
	D, E	No commodity development activities due to HCA allocation under alternative D and total protection of ACEC under alternative E. Consequences: recreation, visual and fishery values would be protected.
	PA	No commodity development in primary zone of existing ACEC; secondary zone of existing ACEC managed on a 150-year timber harvest rotation with 15-25 trees per acre retained at regeneration harvest. Consequences: recreation, visual and fishery values protected.
Rickreall Ridge ACEC	NA	Moderate potential for energy and mineral occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/ONA. Consequences: botanical values could be lost or damaged if energy and mineral development occurs.
	A	No acres of timber harvest included in the 10-year scenario but could possibly be reforested and harvested in the future; moderate potential for energy and minerals occurrence; available for road construction, off-road vehicle use, etc. Consequences: botanical values would be lost or damaged if timber management or energy and mineral development occurs.
	B-E, PA	No commodity development activities due to continued designation as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to R&R block and 35 percent basal area retention (alt. C), HCA (alt. D), habitat protection allocation (alt. E) and OGEA-1 (PA). Consequences: botanical values would be protected.
Saddleback Mtn. ACEC/RNA	NA	Moderate potential for energy occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/RNA. Consequences: botanical values could be lost or damaged if energy development occurs.
	A	112 acres of timber harvest included in the 10-year scenario; moderate potential for energy occurrence; available for road construction, off-road vehicle use, etc. Consequences: botanical values would be lost or damaged.
	B-E, PA	No commodity development activities due to continued designation as an ACEC/RNA and proposal to control surface mineral activity; some additional protection in surrounding area due to R&R block (alt. C), VRM II (alt. E) and connectivity area - 1 (PA). Consequences: botanical values would be protected.
Sandy River Gorge ACEC/ONA	NA	Open to mineral entry but low potential for occurrence; otherwise, protected by continued ACEC/ONA designation. Consequences: none anticipated.
	A	No acres of timber harvest included in the 10-year scenario but could be harvested in the future; low potential for energy and minerals occurrence; available for road construction, off-road vehicle use, etc. Consequences: recreational and natural values could be lost or damaged.
	B-E, PA	No commodity development activities due to continued designation as an ACEC/ONA and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C) and VRM II (alts. D and E). Consequences: recreational and natural values would be protected.

Sheridan Peak ACEC	NA	Moderate potential for energy and mineral occurrence; otherwise, limited commodity development activities due to continued designation as an ACEC/RNA. Consequences: botanical values could be lost or damaged if energy and mineral development occurs.
	A	178 acres of timber harvest included in the 10-year scenario; moderate potential for energy and minerals occurrence; available for road construction, off-road vehicle use, etc. Consequences: botanical values could be lost or damaged.
	B-E	No commodity development activities due to continued designation and protection as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to R&R block and 35 percent basal area retention (alt. C) and HCA (alt. D). Consequences: botanical values would be fully protected.
	PA	No acres of timber harvest included in the 10-year scenario but could be harvested in the future; managed as part of OGEA-2 (150-year timber harvest rotation); harvest and other uses carefully controlled to minimize impacts on botanical values. Consequences: botanical values protected.
Soosap Meadows ACEC	NA	Low potential for energy and mineral occurrence; otherwise, no commodity development activities due to continued designation as an ACEC. Consequences: none anticipated.
	A	29 acres of timber harvest included in the 10-year scenario; low potential for energy and mineral occurrence; available for road construction, off-road vehicle use, etc. Consequences: natural values lost or damaged.
	B-E, PA	No commodity development activities due to continued designation as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to R&R block (alt. C) and habitat protection allocation (alt. E). Consequences: natural values would be protected.
The Butte ACEC/RNA	NA	Moderate potential for energy occurrence; otherwise, no commodity development activities due to continued designation as an ACEC/RNA. Consequences: natural values could be lost or damaged if energy development occurs.
	A	38 acres of timber harvest included in the 10-year scenario; moderate potential for energy occurrence; available for road construction, off-road vehicle use, etc. Consequences: natural values would be lost or damaged.
	B-E, PA	No commodity development activities due to continued designation as an ACEC/RNA and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C) and VRM II (alts. D and E). Consequences: natural values would be protected.
Valley of the Giants ACEC/ONA	NA	Mineral estate held by private company; moderate potential for energy occurrence; otherwise, area protected by continued designation as ACEC/ONA. Consequences: natural values could be lost or damaged if energy development occurs.
	A	17 acres of timber harvest included in the 10-year scenario; moderate potential for energy occurrence; available for road construction, off-road vehicle use, etc. Consequences: natural values would be lost or damaged.
	B-E, PA	No commodity development activities due to continued designation as an ACEC/ONA and proposal to control surface mineral activity; some additional protection in surrounding area due to R&R block (alt. C), HCA (alt. D), habitat protection allocation (alt. E) and OGEA-1 (PA). Consequences: natural values would be protected.

Willamette River Parcels	NA	High potential for energy occurrence; otherwise, parcels protected by continued designation as Willamette River Greenway. Consequences: river values could be damaged if energy development occurs.
	A	High potential for energy occurrence; proposal to control surface mineral activity; continued protection as part of greenway. Consequences: none anticipated.
	B-E, PA	No commodity development activities due to continued protection as part of greenway. Consequences: natural values would be protected.
Williams Lake ACEC	NA	Low potential for energy occurrence; development; otherwise, no commodity development activities due to continued designation as an ACEC. Consequences: none anticipated.
	A	34 acres of timber harvest included in the 10-year scenario; low potential for energy occurrence; available for road construction, off-road vehicle use, etc. Consequences: natural values would be lost or damaged.
	B-E, PA	No commodity development activities due to continued designation as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C) and habitat protection allocation (alt. E). Consequences: natural values would be protected.
Yaquina Head ACEC/ONA	All	Area being developed to enhance public enjoyment of natural values. Consequences: natural values would be protected.
Potential		
A. J. Dwyer Corridor	All	Area protected as part of Wildwood Recreation Site, which is protected as a high use site under all alternatives.
Alsea Bay Island Potential ACEC	NA, PA	No special protective designation so the area is available for commodity development; high potential for energy occurrence. Consequences: possibility of development is slight; state of Oregon protection as an estuarine resource should be sufficient.
	A-E	No commodity development activities due to designation as an ACEC and proposal to control surface mineral activity. Consequences: natural values would be protected.
Crabtree/Shafer Cr. Potential ACEC/RNA/ONA	NA	No special protective designation so the area is available for commodity development; high potential for mineral occurrence. Consequences: possibility of development is likely; natural values would be lost or damaged.
	A	71 acres of timber harvest included in alt. A ten-year scenario; high potential for mineral occurrence. Consequences: natural values would be lost or damaged.
	B-E, PA	No commodity development activities due to designation as an ACEC/RNA/ONA and proposal to control surface mineral activity; some additional protection in surrounding area due to R&R block and 35 percent basal area retention (alt. C), HCA (alt. D), habitat protection allocation (alt. E) and OGEA-1 (PA). Consequences: natural values would be protected.
Eagle Creek Potential Watershed Protection Area	NA, A-D	No special protective designation so the area is available for timber harvest; closed to mineral development activity on surface. Consequences: possibility of harvest is likely; watershed and fishery values would be damaged.
	E, PA	No commodity development activities due to allocation as a special area; closed to mineral development activity on surface. Consequences: watershed and fishery values would be protected.

Forest Peak Potential ACEC	NA	No special protective designation so the area is available for commodity development; moderate potential for energy occurrence. Consequences: possibility of development likely; natural values may be lost or damaged.
	A, B	85 acres (alt. A) and 78 acres (alt. B) of timber harvest included in the 10-year scenarios; moderate potential for energy occurrence. Consequences: natural values would be lost or damaged.
	C-E, PA	No commodity development activities due to designation as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C) and VRM II (alts. D and E). Consequences: natural values would be protected.
North Santiam Potential ACEC	NA	No special protective designation so the area is available for commodity development or disposal; moderate potential for energy occurrence. Consequences: possibility of development or disposal likely; natural values may be lost or damaged.
	A, B	24 acres of timber harvest included in the alt. A and B ten-year scenarios; moderate potential for energy occurrence. Consequences: natural values would be lost or damaged.
	C-E, PA	No commodity development activities due to designation as an ACEC and proposal to control surface mineral activity. Consequences: natural values would be protected.
Walker Flat Potential ACEC	NA, A, B	No special protective designation so the area is available for commodity development; moderate potential for energy and mineral occurrence. Consequences: botanical values could be lost or damaged if energy and mineral development occurs.
	C-E, PA	No commodity development activities due to designation as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C), HCA (alt. D) and RMA (alt. E). Consequences: botanical values would be protected.
Wells Island Potential ACEC	NA, PA	Area included in the Willamette River Greenway and protected from most commodity development; high potential for energy occurrence. Consequences: slight possibility of development; state of Oregon protection of the area as a riparian and recreation resource should be sufficient.
	A-E	No commodity development activities due to designation as an ACEC and proposal to control surface mineral activity. Consequences: riparian and recreation values would be protected.
White Rock Fen Potential ACEC	NA, A, B	No commodity development due to wetland values. Consequences: natural values would be protected.
	C-E, PA	No commodity development activities due to designation as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C), HCA (alt. D), habitat protection allocation (alt. E) and OGEA-1 (PA). Consequences: natural values would be protected.
Wilhoit Springs Potential ACEC	NA	No special protective designation so the area is available for commodity development; high potential for mineral occurrence. Consequences: possibility of development is likely; natural values may be lost or damaged.
	A, B	Available for timber harvest (46 acres of harvest in the alt. A ten-year scenario); high potential for mineral occurrence. Consequences: natural values would be lost or damaged.

	C-E, PA	No commodity development activities due to designation as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to 35 percent basal area retention (alt. C), VRM II (alt. D), and habitat protection allocation (alt. E). Consequences: natural values would be protected.
Yampo Potential ACEC	NA, A, B	No special protective designation so the area is available for commodity development; high potential for energy occurrence. Consequences: natural values would be lost or damaged if mineral development occurs.
	C-E, PA	No commodity development activities due to designation as an ACEC and proposal to control surface mineral activity. Consequences: natural values would be protected.
Yellowstone Creek Potential ACEC	NA	No special protective designation so the area is available for commodity development; moderate potential for mineral occurrence. Consequences: possibility of development is likely; visual resources would be adversely impacted if development occurs.
	A, B	79 acres of timber harvest in the alt. A ten-year scenario and 53 acres alt. B; moderate potential for mineral occurrence. Consequences: visual resources of the area may be adversely impacted due to narrow riparian management area and possibilities of timber blow down and mineral development.
	C-E	No commodity development activities due to designation as an ACEC and proposal to control surface mineral activity; some additional protection in surrounding area due to R&R block (alt. C), HCA (alt. D), and habitat protection allocation (alt. E). Consequences: visual resources would be protected.
	PA	No special protective designation so the area is available for commodity development; moderate potential for mineral occurrence. Consequences: visual resources may be adversely effected by yarding corridors, timber blow down, and mineral development.

Appendix 4-K Rationale Supporting the Determinations of Condition Change Shown in Table 4-21

Appendix 4-K. Rationale Supporting the Determinations of Condition Change Shown in Table 4-21.

River Name		Rationale for Condition Change by Alternative
Crabtree Creek (segment A)	NA	No change; interim protection policy would maintain identified values.
	A	RTUs: 7 units; 54 acres (8% of corridor). RTRs: 0.36 miles new road construction. Other[1]: 75' average-width RMA (each side); VRM Class I management; off-road vehicle use closures and limitations would apply to these allocations. Consequences: no change for all identified outstandingly remarkable values.
		RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: Existing Carolyn's Crown RNA; potential Crabtree Lake ONA and Schafer Creek RNA; 100' average-width RMA (each side); biological diversity, restoration and rehabilitation blocks; VRM Class I management; potential Crabtree Lake SRMA and recreation site; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic, recreation, wildlife and ecological outstandingly remarkable values; no change for identified cultural outstandingly remarkable value.
		RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: Existing Carolyn's Crown RNA; potential Crabtree Lake ONA and Schafer Creek RNA; 150' average-width RMA (each side); biological diversity, 35% basal area retention blocks; VRM Class I management; potential Crabtree Lake SRMA and recreation site; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic, recreation, wildlife and ecological outstandingly remarkable values; no change for identified cultural outstandingly remarkable value.
	D	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: Existing Carolyn's Crown RNA; potential Crabtree Lake ONA and Schafer Creek RNA; 200' average-width RMA (each side); habitat conservation area (spotted owl); VRM Class I management; potential Crabtree Lake SRMA, recreation site and trail; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic, recreation, wildlife and ecological outstandingly remarkable values; no change for identified cultural outstandingly remarkable value.
	E	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: Existing Carolyn's Crown RNA; potential Crabtree Lake ONA and Schafer Creek RNA; 200' average-width RMA (each side); habitat protection areas; VRM Class I management; potential Crabtree Lake SRMA, recreation site and trail; off-road vehicle use closures and limitations would apply to these allocations.

Appendix 4-K. Rationale Supporting the Determinations of Condition Change Shown in Table 4-21.

River Name		Rationale for Condition Change by Alternative
		Consequences: beneficial for identified scenic, recreation, wildlife and ecological outstandingly remarkable values; no change for identified cultural outstandingly remarkable value.
	PA	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: Existing Carolyn's Crown RNA; potential Crabtree Lake ONA and Schafer Creek RNA; 150' average-width RMA (each side); old-growth emphasis area (300-year timber harvest rotation); VRM Class I management; potential Crabtree Lake SRMA, recreation site and trail; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic, recreation, wildlife and ecological outstandingly remarkable values; no change for identified cultural outstandingly remarkable value.
Elkhorn Creek	NA	No change; interim protection policy would maintain identified values.
	A	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 75' average-width RMA (each side); VRM Class II management; off-road vehicle use limitations would apply to these allocations. Consequences: beneficial for identified scenic and wildlife outstandingly remarkable values.
	B	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.0 miles new road construction. Other[1]: 140' average-width RMA (each side); biological diversity, restoration and rehabilitation blocks; VRM Class II management; off-road vehicle use limitations would apply to these allocations. Consequences: beneficial for identified scenic and wildlife outstandingly remarkable values.
	C	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 210' average-width RMA (each side); biological diversity, 35% basal area retention blocks; VRM Class II management; off-road vehicle use limitations would apply to these allocations. Consequences: beneficial for identified scenic and wildlife outstandingly remarkable values.
	D	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 280' average-width RMA (each side); VRM Class II management; off-road vehicle use limitations would apply to this allocation. Consequences: beneficial for identified scenic and wildlife outstandingly remarkable values.
	E	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 280' average-width RMA (each side); habitat protection areas; VRM Class I management; potential recreation trail; off-road

Appendix 4-K. Rationale Supporting the Determinations of Condition Change Shown in Table 4-21.

River Name	Rationale for Condition Change by Alternative	
		vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and wildlife outstandingly remarkable values.
	PA	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 210' average-width RMA (each side); connectivity area (200-year timber harvest rotation); VRM Class II management; potential recreation trail; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and wildlife outstandingly remarkable values.
Lobster Creek (segment A)	NA	No change; interim protection policy would maintain identified values.
	A	RTUs: 6 units; 98 acres (7% of corridor). RTRs: 0.25 miles new road construction. Other[1]: 75' average-width RMA (each side); off-road vehicle use limitations would apply to this allocation. Consequences: no change for identified fish outstandingly remarkable value.
	B	RTUs: 4 units; 76 acres (5% of corridor). RTRs: 0.12 miles new road construction. Other[1]: 140' average-width RMA (each side); biological diversity, restoration and rehabilitation blocks; off-road vehicle use limitations would apply to these allocations. Consequences: no change for identified fish outstandingly remarkable value.
	C	RTUs: 4 units; 35 acres (2% of corridor.) RTRs: 0.42 miles new road construction. Other[1]: 210' average-width RMA (each side); biological diversity, 35% basal area retention blocks; off-road vehicle use limitations would apply to these allocations. Consequences: no change for identified fish outstandingly remarkable value.
	D	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 280' average-width RMA (each side); habitat conservation area (spotted owl); off-road vehicle use limitations would apply to these allocations. Consequences: no change for identified fish outstandingly remarkable value.
	E	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 280' average-width RMA (each side); habitat protection areas; off-road vehicle use limitations would apply to these allocations. Consequences: no change for identified fish outstandingly remarkable value.

Appendix 4-K. Rationale Supporting the Determinations of Condition Change Shown in Table 4-21.

River Name		Rationale for Condition Change by Alternative
	PA	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 210' average-width RMA (each side); old-growth emphasis area (300-year timber harvest rotation); off-road vehicle use limitations would apply to these allocations. Consequences: no change for identified fish outstandingly remarkable value.
Molalla River (segment B)	NA	No change; interim protection policy would maintain identified values.
	A	RTUs: 4 units; 34 acres (<1% of corridor). RTRs: 3.82 miles new road construction. Other[1]: 75' average-width RMA (each side); VRM Class II management; off-road vehicle use limitations would apply to these allocations. Consequences: no change for all identified outstandingly remarkable values.
	B	RTUs: 4 units; 28 acres (<1% of corridor). RTRs: 0.20 miles new road construction. Other[1]: 160' average-width RMA (each side); VRM Class II management; potential recreation site; off-road vehicle use closures and limitations would apply to these allocations. Consequences: no change for all identified outstandingly remarkable values.
	C	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 240' average-width RMA (each side); VRM Class II management; potential recreation site; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and recreation outstandingly remarkable values; no change for identified geological outstandingly remarkable value.
	D	RTUs: 4 units; 28 acres (<1% of corridor). RTRs: 0.20 miles new road construction. Other[1]: 320' average-width RMA (each side); VRM Class II management; potential recreation site; off-road vehicle use closures and limitations would apply to these allocations. Consequences: no change for all identified outstandingly remarkable values.
	E	RTUs: 4 units; 28 acres (<1% of corridor). RTRs: 0.20 miles new road construction. Other[1]: 320' average-width RMA (each side); habitat protection areas; VRM Class II management; potential recreation site; off-road vehicle use closures and limitations would apply to these allocations. Consequences: no change for all identified outstandingly remarkable values.

Appendix 4-K. Rationale Supporting the Determinations of Condition Change Shown in Table 4-21.

River Name		Rationale for Condition Change by Alternative
	PA	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 240' average-width RMA (each side); old-growth emphasis area (300-year timber harvest rotation); VRM Class II management; potential recreation site; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and recreation outstandingly remarkable values; no change for identified geological outstandingly remarkable value.
Nestucca River (segment A)	NA	No change; interim protection policy would maintain identified values.
	A	RTUs: 54 units; 839 acres (17% of corridor). RTRs: 0.41 miles new road construction. Other[1]: 75' average-width RMA (each side); designated state scenic waterway; VRM Class I and II management; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: adverse for identified scenic and recreation outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
	B	RTUs: 30 units; 361 acres; (7% of corridor). RTRs: 0.26 miles new road construction. Other[1]: Existing Nestucca River and Elk Creek ACECs; 160' average-width RMA (each side); designated state scenic waterway; VRM Class I and II management; existing Nestucca River SRMA; existing Alder Glen, Dovre, Elk Bend and Fan Creek Recreation Sites; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: adverse for identified scenic and recreation outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
	C	RTUs: 18 units; 196 acres (4% of corridor). RTRs: 0.80 miles new road construction. Other[1]: Existing Nestucca River and Elk Creek ACECs; 240' average-width RMA (each side); biological diversity, 35% basal area retention blocks; designated state scenic waterway; VRM Class I and II management; existing Nestucca River SRMA; existing Alder Glen, Dovre, Elk Bend and Fan Creek Recreation Sites; potential recreation site and trail; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: no change for all identified outstandingly remarkable values.
	D	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: Existing Nestucca River and Elk Creek ACECs; 320' average-width RMA (each side); habitat conservation area (spotted

Appendix 4-K. Rationale Supporting the Determinations of Condition Change Shown in Table 4-21.

River Name		Rationale for Condition Change by Alternative
		owl); designated state scenic waterway; VRM Class I and II management; existing Nestucca River SRMA; existing Alder Glen, Dovre, Elk Bend and Fan Creek Recreation Sites; potential recreation site and trail; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and recreation outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
	E	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: Existing Nestucca River and Elk Creek ACECs; 320' average-width RMA (each side); habitat protection areas; designated state scenic waterway; VRM Class I and II management; existing Nestucca River SRMA; existing Alder Glen, Dovre, Elk Bend and Fan Creek Recreation Sites; potential recreation site and trail; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and recreation outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
	PA	RTUs: 1 unit; 3 acres (<1% of corridor). RTRs: 0.00 miles new road construction. Other[1]: Existing Nestucca River and Elk Creek ACECs; 320' average-width RMA (each side); old-growth emphasis area (200-year timber harvest rotation); designated state scenic waterway; VRM Class I management; existing Nestucca River SRMA; existing Alder Glen, Dovre, Elk Bend and Fan Creek Recreation Sites; potential recreation site and trail; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and recreation outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
North Fork Alsea River	NA	No change; interim protection policy would maintain identified values.
	A	RTUs: 9 units; 116 acres (3% of corridor). RTRs: 0.50 miles new road construction. Other[1]: 75' average-width RMA (each side); VRM Class I and II management; off-road vehicle use closures and limitations would apply to these allocations. Consequences: adverse for identified scenic and wildlife outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
	B	RTUs: 10 units; 164 acres (5% of corridor). RTRs: 0.46 miles new road construction. Other[1]: 160' average-width RMA (each side); biological diversity, restoration and rehabilitation blocks; VRM Class I and II management; off-road vehicle use closures and limitations would

River Name		Rationale for Condition Change by Alternative
		apply to these allocations. Consequences: adverse for identified scenic and wildlife outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
	C	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.24 miles new road construction. Other[1]: 240' average-width RMA (each side); biological diversity, 35% basal area retention blocks; VRM Class I and II management; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and wildlife outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
	D	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 320' average-width RMA (each side); habitat conservation area (spotted owl); VRM Class I and II management; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and wildlife outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
	E	RTUs: 5 units; 20 acres (<1% of corridor). RTRs: 0.05 miles new road construction. Other[1]: 320' average-width RMA (each side); habitat protection areas; potential recreation trail; VRM Class I and II management; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and wildlife outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
	PA	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 240' average-width RMA (each side); old-growth emphasis area (300-year timber harvest rotation); VRM Class I and II management; potential recreation trail; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified scenic and wildlife outstandingly remarkable values; no change for identified fish outstandingly remarkable value.
South Fork Alsea River	NA	No change; interim protection policy would maintain identified values.
	A	RTUs: 21 units; 303 acres (6% of corridor). RTRs: 1.48 miles new road construction. Other[1]: 75' average-width RMA (each side); VRM Class II management; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations.

Appendix 4-K. Rationale Supporting the Determinations of Condition Change Shown in Table 4-21.

River Name		Rationale for Condition Change by Alternative
		Consequences: adverse for identified geological outstandingly remarkable value.
	B	RTUs: 15 units; 209 acres (4% of corridor). RTRs: 0.29 miles new road construction. Other[1]: 160' average-width RMA (each side); biological diversity, restoration and rehabilitation blocks; existing Alsea Falls Recreation Site; VRM Class I and II management; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: no change for identified geological outstandingly remarkable value.
	C	RTUs: 12 units; 136 acres (3% of corridor). RTRs: 0.67 miles new road construction. Other[1]: 240' average-width RMA (each side); biological diversity, 35% basal area retention blocks; existing Alsea Falls Recreation Site and potential expansion area; VRM Class I and II management; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: no change for identified geological outstandingly remarkable value.
	D	RTUs: 13 units; 154 acres (3% of corridor). RTRs: 0.42 miles new road construction. Other[1]: 320' average-width RMA (each side); existing Alsea Falls Recreation Site and potential expansion area; VRM Class I and II management; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: no change for identified geological outstandingly remarkable value.
	E	RTUs: 2 units; 12 acres (<1% of corridor). RTRs: 0.07 miles new road construction. Other[1]: 320' average-width RMA (each side); habitat protection areas; existing Alsea Falls Recreation Site and potential expansion area and recreation trail; VRM Class I and II management; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: no change for identified geological outstandingly remarkable value.
	PA	RTUs: 19 units; 233 acres (4% of corridor). RTRs: 1.80 miles new road construction. Other[1]: 240' average-width RMA (each side); connectivity area (150-year timber harvest rotation); existing Alsea Falls Recreation Site and potential expansion area and recreation trail; VRM Class II management; two elk emphasis areas; off-road vehicle use closures and limitations would apply to these allocations. Consequences: no change for identified geological outstandingly remarkable value.

Appendix 4-K. Rationale Supporting the Determinations of Condition Change Shown in Table 4-21.

River Name		Rationale for Condition Change by Alternative
Walker Creek	NA	No change; interim protection policy would maintain identified values.
	A	RTUs: 3 units; 74 acres (9% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 75' average-width RMA (each side); designated state scenic waterway; Walker Flat special status species habitat; VRM Class II management; off-road vehicle use closures and limitations would apply to these allocations. Consequences: adverse for identified ecological outstandingly remarkable value.
	B	RTUs: 4 units; 57 acres (7% of corridor). RTRs: 0.24 miles new road construction. Other[1]: 100' average-width RMA (each side); biological diversity, restoration and rehabilitation blocks; designated state scenic waterway; Walker Flat special status species habitat; VRM Class I and II management; off-road vehicle use closures and limitations would apply to these allocations. Consequences: adverse for identified ecological outstandingly remarkable value.
	C	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.15 miles new road construction. Other[1]: 150' average-width RMA (each side); designated state scenic waterway; potential Walker Flat ACEC; VRM Class I and II management; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified ecological outstandingly remarkable value.
	D	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 200' average-width RMA (each side); habitat conservation area (spotted owl); designated state scenic waterway; potential Walker Flat ACEC; VRM Class I and II management; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified ecological outstandingly remarkable value.
	E	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 200' average-width RMA (each side); habitat protection areas; designated state scenic waterway; potential Walker Flat ACEC; VRM Class I and II management; off-road vehicle use closures and limitations would apply to these allocations. Consequences: beneficial for identified ecological outstandingly remarkable value.
	PA	RTUs: 0 units; 0 acres (0% of corridor). RTRs: 0.00 miles new road construction. Other[1]: 150' average-width RMA (each side); old-growth emphasis area (200-year timber harvest rotation);designated state scenic waterway; potential Walker Flat ACEC; VRM Class I and II management; off-road vehicle use closures and limitations would

Appendix 4-K. Rationale Supporting the Determinations of Condition Change Shown in Table 4-21.

River Name	Rationale for Condition Change by Alternative
	apply to these allocations. Consequences: beneficial for identified ecological outstandingly remarkable value.

1. These protective allocations would either partially or wholly cover lands within the approximate 1/2-mile wide river corridor. Overlapping coverage would occur in some circumstances, and no attempt has been made to separate these allocations into mutually exclusive acreage figures.

Appendix 4-L
Acres and Volume Harvested by Decade

Alternative A — Acre Harvest

Age Group	1st Regen	1st Thin	2nd Regen	2nd Thin	3rd Regen	3rd Thin	5th Regen	5th Thin	10th Regen	10th Thin
30	0	79	0	183	0	242	0	76	0	352
40	0	0	0	1,650	0	9,471	0	10,988	25,177	19,006
50	0	4,068	0	4,297	0	0	4,618	0	19,017	2,550
60-70	0	0	8,176	65	24,078	0	36,571	4,123	9,846	4,724
80-90	4,618	0	12,337	0	13,679	0	9,073	0	0	0
100-190	20,924	0	24,192	0	15,461	0	0	0	0	0
200+	19,972	0	5,102	0	0	0	0	0	0	0
Totals	45,514	4,147	49,807	6,195	53,218	9,713	50,262	15,187	54,040	26,632

Alternative A — Cubic Volume Harvest (MMCF)

Age Group	1st Regen	1st Thin	2nd Regen	2nd Thin	3rd Regen	3rd Thin	5th Regen	5th Thin	10th Regen	10th Thin
30	0.00	0.10	0.00	0.23	0.00	0.30	0.00	0.10	0.00	0.47
40	0.00	0.00	0.00	1.98	0.00	10.87	0.00	13.44	213.59	25.33
50	0.00	6.23	0.00	6.48	0.00	0.00	48.98	0.00	166.99	2.24
60-70	0.00	0.00	68.74	0.13	189.82	0.00	346.81	5.17	104.01	6.56
80-90	9.94	0.00	88.98	0.00	147.00	0.00	104.71	0.00	0.00	0.00
100-190	250.08	0.00	291.44	0.00	171.20	0.00	0.00	0.00	0.00	0.00
200+	252.85	0.00	61.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	512.87	6.33	510.37	8.83	508.03	11.17	500.50	18.70	484.59	34.61

Alternative B — Acre Harvest

Age Group	1st Regen	1st Thin	2nd Regen	2nd Thin	3rd Regen	3rd Thin	5th Regen	5th Thin	10th Regen	10th Thin
30	0	79	0	193	0	192	0	98	0	342
40	0	0	0	1604	0	8544	0	10237	23842	17197
50	0	3984	0	4068	0	0	8240	0	16379	3185
60-70	154	0	12124	58	27271	0	32354	3597	5549	1539
80-90	6191	0	11141	0	10019	0	4045	0	0	0
100-190	20276	0	16298	0	8518	0	0	0	0	0
200+	13110	0	3084	0	0	0	0	0	0	0
Totals	39,731	4,063	42,647	5,923	45,808	8,736	44,639	13,932	45,770	22,263

Alternative B — Cubic Volume Harvest (MMCF)

Age Group	1st Regen	Thin	2nd Regen	Thin	3rd Regen	Thin	5th Regen	Thin	10th Regen	Thin
30	0.00	0.10	0.00	0.24	0.00	0.24	0.00	0.12	0.00	0.46
40	0.00	0.00	0.00	1.92	0.00	9.82	0.00	12.56	192.23	22.52
50	0.00	6.10	0.00	6.17	0.00	0.00	76.94	0.00	156.49	3.34
60-70	0.21	0.00	103.01	0.12	232.83	0.00	298.61	4.52	61.63	1.93
80-90	25.53	0.00	96.95	0.00	103.84	0.00	45.84	0.00	0.00	0.00
100-190	237.24	0.00	92.60	0.00	91.87	0.00	0.00	0.00	0.00	0.00
200+	166.40	0.00	36.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	429.37	6.19	329.02	8.45	428.54	10.06	421.40	17.20	410.35	28.25

Alternative C — Acre Harvest

Age Group	1st Regen	Thin	2nd Regen	Thin	3rd Regen	Thin	5th Regen	Thin	10th Regen	Thin
30	0	0	0	0	0	4	293	1893	239	17225
40	0	0	0	0	529	396	511	3119	360	5714
50	0	10883	0	15069	514	5847	141	25514	341	12663
60-70	4619	0	7906	0	14680	102	1470	14886	4339	4403
80-90	3221	6228	28	8081	1685	12107	3163	15621	7129	14768
100-190	4990	8931	1771	11550	5712	7004	4733	7483	14969	27611
200+	5156	0	3708	0	214	291	6709	505	5627	7245
Totals	17,986	26,042	13,413	34,700	23,334	25,751	17,020	69,021	33,004	89,629

Alternative C — Cubic Volume Harvest (MMCF)

Age Group	1st Regen	Thin	2nd Regen	Thin	3rd Regen	Thin	5th Regen	Thin	10th Regen	Thin
30	0.00	0.00	0.00	0.00	0.00	0.01	3.18	5.22	1.33	66.10
40	0.00	0.00	0.00	0.00	1.32	3.98	3.98	9.46	2.52	34.76
50	0.00	18.90	0.00	28.87	0.74	13.47	2.03	56.60	2.49	45.09
60-70	19.97	0.00	46.41	0.00	70.31	0.99	10.76	66.10	33.32	22.43
80-90	5.27	14.87	0.04	19.32	3.13	30.39	20.66	44.09	17.68	66.88
100-190	43.03	23.44	15.15	30.38	43.98	20.81	30.17	26.03	84.93	63.41
200+	45.92	0.00	29.78	0.00	2.20	5.26	44.58	5.43	26.43	17.27
Totals	114.18	57.22	91.38	78.57	121.68	74.92	115.35	212.93	168.71	315.94

Alternative D — Acre Harvest

Age Group	1st Regen	Thin	2nd Regen	Thin	3rd Regen	Thin	5th Regen	Thin	10th Regen	Thin
30	0	0	0	0	0	0	0	0	0	0
40	644	0	352	0	1060	0	1532	0	2347	0
50	1710	0	1738	0	982	0	1417	0	2055	0
60-70	3305	0	7403	0	8333	0	4550	0	7055	0
80-90	2539	0	2566	0	4285	0	7319	0	7377	0
100-190	6063	0	5449	0	6178	0	4727	0	1400	0
200+	3402	0	1955	0	1044	0	48	0	2	0
Totals	17,663	0	19,463	0	21,882	0	19,593	20,236	20,236	0

Alternative D — Cubic Volume Harvest (MMCF)

Age Group	1st Regen	Thin	2nd Regen	Thin	3rd Regen	Thin	5th Regen	Thin	10th Regen	Thin
30	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
40	3.46	0.00	1.89	0.00	5.69	0.00	8.23	0.00	12.61	0.00
50	12.39	0.00	12.60	0.00	7.12	0.00	10.27	0.00	14.89	0.00
60-70	30.86	0.00	32.79	0.00	39.93	0.00	24.48	0.00	49.21	0.00
80-90	31.06	0.00	30.85	0.00	40.36	0.00	58.17	0.00	28.21	0.00
100-190	88.85	0.00	71.83	0.00	95.38	0.00	70.61	0.00	19.68	0.00
200+	38.81	0.00	22.30	0.00	11.91	0.00	0.55	0.00	0.02	0.00
Totals	205.44		172.26		200.39		172.31		124.63	

Alternative E — Acre Harvest

Age Group	1st Regen	Thin	2nd Regen	Thin	3rd Regen	Thin	5th Regen	Thin	10th Regen	Thin
30	0	49	0	114	0	109	0	29	0	123
40	0	0	0	1119	0	5011	0	5970	13874	8942
50	0	3208	29	2677	123	0	3975	0	5271	1101
60-70	745	0	12738	15	19347	0	15380	1814	1423	2661
80-90	4128	0	4463	0	2401	0	1176	0	1025	0
100-190	15875	0	5307	0	1626	0	1297	0	1300	0
200+	27	0	0	0	0	0	0	0	0	0
Totals	20,775	3,257	22,537	3,925	23,497	5,120	21,828	7,813	22,893	12,827

Alternative E — Cubic Volume Harvest (MMCF)

Age Group	1st Regen	Thin	2nd Regen	Thin	3rd Regen	Thin	5th Regen	Thin	10th Regen	Thin
30	0.00	0.06	0.00	0.15	0.00	0.14	0.00	0.04	0.00	0.17
40	0.00	0.00	0.00	1.38	0.00	5.87	0.00	7.37	99.62	13.55
50	0.00	5.06	0.17	3.99	0.42	0.00	39.68	0.00	44.71	1.37
60-70	1.13	0.00	105.12	0.03	159.13	0.00	134.20	2.26	12.81	5.50
80-90	25.01	0.00	39.17	0.00	25.23	0.00	10.68	0.00	9.33	0.00
100-190	180.09	0.00	61.88	0.00	21.11	0.00	17.67	0.00	24.84	0.00
200+	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	206.78	5.12	206.35	5.55	205.89	6.01	202.23	9.67	191.31	20.59

Preferred Alternative — Acre Harvest

Age Group	1st Regen	Thin	2nd Regen	Thin	3rd Regen	Thin	5th Regen	Thin	10th Regen	Thin
30	0	0	0	0	0	0	0	0	0	0
40	0	219	0	12	0	998	0	642	0	918
50	2737	5097	449	10419	1064	4076	1	11687	0	5953
60-70	2699	2168	5095	2846	6978	4222	220	8306	844	4943
80-90	3579	1814	2140	1607	5528	1383	9457	2835	1384	2641
100-190	7002	506	6529	3811	4855	580	4320	927	7802	2369
200+	6653	0	3634	108	1994	18	517	0	3507	23
Totals	22,670	9,804	17,847	18,803	20,419	11,277	14,515	24,397	13,537	16,847

Preferred Alternative — Cubic Volume Harvest (MMCF)

Age Group	1st Regen	Thin	2nd Regen	Thin	3rd Regen	Thin	5th Regen	Thin	10th Regen	Thin
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.23	0.00	0.01	0.00	1.05	0.00	0.68	0.00	1.20
50	4.11	7.75	0.53	14.78	1.13	6.56	0.00	20.54	0.00	11.47
60-70	7.09	3.75	48.14	4.57	57.02	7.53	0.29	14.55	7.01	8.72
80-90	15.16	3.67	14.51	3.28	57.04	2.81	115.83	5.70	17.10	5.39
100-190	82.90	0.91	74.58	7.73	53.42	1.09	48.67	2.00	110.48	5.43
200+	79.94	0.00	39.69	0.19	22.53	0.03	7.04	0.00	47.42	0.03
Totals	189.21	16.31	177.44	30.57	191.14	19.07	171.84	43.46	182.01	32.24

Average Acres Treated by Decade and Alternative

Alternative NA

	Acres by Decade 1st	2nd	3rd	5th	10th
Regeneration Harvest					
Clear Cut	31,000	38,200	43,900	40,500	35,100
Partial Retention	0	0	0	0	0
Intermediate Harvest	500	500	500	500	500
Site Preparation	27,900	34,400	39,500	36,400	31,600
Planting	34,200	42,100	48,400	44,600	38,700
Normal Stock	13,700	5,100	10,300	7,200	2,600
Genetic Stock	20,500	37,000	38,000	37,400	36,100
Plantation Maintenance	18,600	22,900	26,400	24,300	21,100
PCT & Release	27,900	34,400	39,500	36,400	31,600
Animal Damage Control	7,800	9,600	11,000	10,100	8,800
Fertilization	38,100	43,500	51,300	70,600	88,500
Site Conversion	1,200	2,900	3,000	1,200	400

Alternative A

	Acres by Decade 1st	2nd	3rd	5th	10th
Regeneration Harvest					
Clear Cut	45,600	49,800	53,300	50,300	54,100
Partial Retention	0	0	0	0	0
Intermediate Harvest	4,200	6,200	9,700	15,200	26,700
Site Preparation	39,400	42,800	45,900	43,200	46,600
Planting	50,200	54,900	58,600	55,400	59,600
Normal Stock	29,200	16,400	18,200	16,700	19,900
Genetic Stock	21,000	38,500	40,400	38,700	39,600
Plantation Maintenance	27,300	29,900	32,000	30,200	32,500
PCT & Release	41,000	44,900	47,900	45,300	48,700
Animal Damage Control	11,400	12,500	13,300	12,600	13,500
Fertilization	41,500	50,000	56,100	82,400	99,500
Site Conversion	3,600	4,100	5,400	1,700	300

Alternative B

	Acres by Decade 1st	2nd	3rd	5th	10th
Regeneration Harvest					
Clear Cut	40,100	42,700	45,800	44,700	45,800
Partial Retention	0	0	0	0	0
Intermediate Harvest	4,100	5,900	8,700	13,900	22,300
Site Preparation	36,100	38,400	41,300	40,200	41,300
Planting	44,200	47,100	50,600	49,300	50,600
Normal Stock	23,300	10,500	11,400	11,700	12,800
Genetic Stock	21,000	36,600	39,200	37,600	37,800
Plantation Maintenance	24,000	25,600	27,500	26,800	27,500
PCT & Release	36,100	38,400	41,300	40,200	41,300
Animal Damage Control	10,000	10,700	11,500	11,200	11,500
Fertilization	38,700	46,000	51,100	71,100	85,100
Site Conversion	3,600	3,400	3,900	1,600	500

Alternative C

	Acres by Decade				
	1st	2nd	3rd	5th	10th
Regeneration Harvest					
Clear Cut	0	0	0	0	0
Partial Retention	18,000	13,400	20,300	10,500	14,300
Intermediate Harvest	26,000	35,300	23,900	48,400	38,100
Site Preparation	11,300	8,500	12,800	6,600	9,000
Planting	18,500	13,900	21,000	10,900	15,000
Normal Stock	9,200	6,900	10,500	5,500	7,500
Genetic Stock	9,200	6,900	10,500	5,500	7,500
Plantation Maintenance	7,900	5,800	8,800	4,700	6,300
PCT & Release	11,900	9,300	14,100	6,700	10,100
Animal Damage Control	1,800	1,300	2,000	1,100	1,400
Fertilization	31,400	37,900	43,900	36,900	8,400
Site Conversion	4,800	1,600	5,000	400	300

Alternative D

	Acres by Decade				
	1st	2nd	3rd	5th	10th
Regeneration Harvest					
Clear Cut	17,700	19,500	21,900	19,600	20,200
Partial Retention	0	0	0	0	0
Intermediate Harvest	2,800	0	0	0	0
Site Preparation	15,900	17,500	19,700	17,600	18,200
Planting	19,300	21,300	23,900	21,400	22,100
Normal Stock	1,100	0	0	0	0
Genetic Stock	18,200	21,300	23,900	21,400	22,100
Plantation Maintenance	10,600	11,700	13,100	11,800	12,100
PCT & Release	15,900	17,500	19,700	17,600	18,200
Animal Damage Control	4,400	4,900	5,500	4,900	5,100
Fertilization	0	0	0	0	0
Site Conversion	0	0	0	0	0

Alternative E

	Acres by Decade				
	1st	2nd	3rd	5th	10th
Regeneration Harvest					
Clear Cut	20,900	22,600	23,500	21,900	23,000
Partial Retention	0	0	0	0	0
Intermediate Harvest	3,300	3,900	5,100	7,800	12,900
Site Preparation	18,800	20,300	21,200	19,700	20,700
Planting	22,900	24,800	25,800	24,000	25,200
Normal Stock	5,100	0	800	0	0
Genetic Stock	17,800	24,800	25,100	24,000	25,200
Plantation Maintenance	12,500	13,600	14,100	13,100	13,800
PCT & Release	18,800	20,300	21,200	19,700	20,700
Animal Damage Control	5,200	5,600	5,900	5,500	5,700
Fertilization	21,600	26,100	26,200	32,900	35,500
Site Conversion	2,000	1,100	1,900	600	100

Preferred Alternative

	Acres by Decade 1st	2nd	3rd	5th	10th
Regeneration Harvest					
Clear Cut	0	0	0	0	0
Partial Retention	23,600	18,400	20,900	14,500	13,400
Intermediate Harvest	9,800	18,800	11,300	24,400	16,900
Site Preparation	19,300	15,100	17,100	11,900	11,000
Planting	25,300	19,800	22,400	15,600	14,400
Normal Stock	6,600	0	0	0	0
Genetic Stock	18,700	19,800	22,400	15,600	14,400
Plantation Maintenance	13,200	10,300	11,700	8,100	7,500
PCT & Release	21,200	16,600	18,800	13,100	12,000
Animal Damage Control	5,200	7,900	9,000	6,200	5,700
Fertilization	14,600	17,000	15,900	29,100	33,400
Site Conversion	4,900	1,300	2,400	100	100

Source: Trim-Plus output files, Micro*Storms records, and estimates of district silviculture and fuels specialists

Appendix 4-M. Timber Supply Analysis For BLM Planning

The purpose of this analysis is to report regional stumpage price[1], timber harvest on all ownerships, and log consumption within geographically defined subregions (figure 1) resulting from implementing each of the five common resource management plan alternatives, as well as the preferred alternatives, on all U. S. Department of the Interior Bureau of Land Management (BLM) Districts in western Oregon. The analysis covers a period of initial plan implementation (1993-2000)[2] and the period thereafter (2001-2010). The baseline period that provides a historical benchmark for comparison was 1984-1988.

The purposes of this appendix are to: summarize key concepts used to conduct the analysis, provide a description of the procedures used, and briefly compare the analysis results to the baseline period and an earlier outlook of western Oregon timber supply (Sessions 1990). Results appear in chapter 4 of the RMP/EIS describing the effects of alternatives. Specifically, the regional stumpage price results were used to calculate an index of BLM stumpage price changes (relative to the 1984-1988 baseline price). These price changes were then used in the assessment of personal income and employment effects. Harvest and log consumption results are presented in the timber supply tables of chapter 4.

Key Concepts

Implemented on all Districts, each set of similar resource management plan alternatives represented a different timber supply policy, or alternative theme, for BLM administered lands in western Oregon. The question being addressed by this analysis is how do changes in BLM timber supply policy affect how much timber is harvested and consumed in subregions of western Oregon? The subregions in figure 1 were explicitly interdependent through the transfer of logs from one subregion to another. The importance of subregions was in their partitioning of western Oregon into areas that differed in ownership distribution, private timber availability, and silvicultural management, while at the same time serving as logical reporting areas for western Oregon BLM Districts (see table 1).

This analysis recognized that the BLM is just one timber supplier within western Oregon and that the impact of harvest changes is felt where the timber is actually consumed. Furthermore, any measure of the timber harvest and related consumption consequences of BLM actions must account for how the private land ownership reacts to changes in BLM timber supply policy. The amount of timber offered for sale by the BLM affects stumpage prices and these effects influence the decision of private forestland owners to harvest their timber. The result is an inverse relationship between the amount of BLM timber offered and the amount of private timber harvest.

The amount of timber demanded by processing mills is inversely related to stumpage prices. Timber demand is determined by factors outside the control of the BLM or any other forest land ownership category, such as end use consumption in the national economy (for example, the number of new homes being built) and other national economic variables like gross domestic product and the interest rate. Poor demand years result in low levels of consumption and low product prices; good years feature the same level of consumption under higher product prices. For the purpose of this analysis, year to year fluctuations in timber demand were averaged over a 10 year analysis period.

Timber supply is determined by ownership, subregional location, and stand condition. Ownership determines the policy specifying the conditions under which the timber may be harvested. Subregional location accounts for variations in species composition and the amount of timber available for harvest. Stand condition measures the amount of harvestable volume available on a per acre basis, as well as the growth rate and stage of development of this volume. Private timber supply is directly proportional to stumpage prices. This analysis accounted for changes in private timber supply by assessing inventory conditions at the beginning of each analysis period. For public agencies such as the USDA Forest Service and the BLM, timber supply is fixed at the planned allowable sale quantity; regardless of the stumpage price (down to a minimum acceptable bid), the same amount of timber would be harvested over the analysis period.

Market equilibrium defines a balance between timber supply and demand: the amount of timber harvested equals the amount of timber consumed and one stumpage price governs the exchange between suppliers and demanders. Implementing a new BLM timber policy will disrupt this balance and leads to

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[1]Definitions for terms such as regional stumpage price can be found in the terminology section following the main text.

[2]Actual data was completed through the end of 1990. Analysis results covering the 1991-2000 period were converted to an annual basis and reported for the 1993-2000 period since the BLM resource management plan implementation was assumed not to commence prior to 1993.

adjustments in the stumpage price such that a new timber supply and demand balance is created. In this analysis, market equilibrium is explicitly recognized for the Pacific Northwest - westside region, and this implies a local equilibrium within western Oregon subregions.

Procedure

The procedures used for the 1991-2000 period were: solving regional market equilibrium, disaggregation of the regional private harvest, displaying the timber harvest by ownership, and reapportioning the timber harvest as log consumption by processing facilities. Log exports from private and other public lands to foreign destinations was treated as domestic log consumption at the port of export.

In contrast, the procedures used over the 2001-2010 period were not dependent on a regional market equilibrium solution; rather the private harvest projections reflected the same behavioral response to the implemented resource management plans determined for the 1991-2000 period. This allowed the analysis to focus on whether the private inventory would provide a lower, same, or higher harvest over 2001-2010 when compared to the estimated 1991-2000 harvest.

Solving Regional Market Equilibrium; 1991-2000

This step determined the market adjustments, and associated regional stumpage price, that would result if a given set of resource management plan alternatives were implemented on BLM administered lands in western Oregon. The Timber Assessment Market Model (TAMM) (Adams and Haynes 1980, Haynes and Adams 1985, and Haynes 1990) was used to calculate the new regional stumpage price balancing timber supply and demand. The Timber Assessment Market Model was ideal for this kind of analysis since the model provided 50 year projections of consumption, production, and prices of forest products and stumpage under an array of externally specified conditions on policy and the economic environment surrounding the forest sector. The model is national is scope and is divided into 11 supply regions and 5 demand regions. Solution is in the form of a spatial supply and demand balance amongst regions. Therefore, the market equilibrium for the Pacific Northwest - westside region was dependent in part on what is happening in other regions of the U. S. Overall, the quantities produced and their distribution to demand regions is based on the maximization of producer profits net of transfer costs in each supply region.

The external policy condition that was changed for each TAMM run was the BLM sawtimber sale quantity resulting from holding each District in western Oregon at similar resource management plan alternatives. Four TAMM runs were made, each with a different resource management plan theme: current plans (i.e., no action), alternative A, alternative C, and the preferred alternative. Implementation of BLM resource management plans was assumed to commence in 1993. In order to reflect actual conditions since 1990, reported and estimated BLM sawtimber harvest quantities were used in 1991 and 1992 for all four runs. Similarly for 1991 National Forest harvest quantities. The National Forest sawtimber sale quantities for Pacific Northwest - westside forests in 1992 and beyond reflected planned offerings under the USDA Forest Service Spotted Owl Final Environmental Impact Statement, record of decision in March 1992 (U. S. Department of Agriculture 1992a and 1992b).

The key outputs for each TAMM run were the regional price and the total (hardwood and softwood) private growing stock removals for the Pacific Northwest - westside (PNWW) region. Growing stock removal was the relevant output because it represented the portion of total harvest that comes from the private inventory[3]. Annual removals from the industrial and other private ownership classes in TAMM (softwood and har&dwood volume combined) were summed to estimate the total private removal over the 1991-2000 period. The western Oregon share of the 1991-2000 PNWW total harvest was taken to be 0.4466, the historical 1971-1990 average of western Oregon's proportion of the total Pacific Northwest - westside private harvest (figure 2).

In summary, the regional market equilibrium solution resulted in a Pacific Northwest - westside regional stumpage price and western Oregon's share of the corresponding private growing stock removals, given a set of similar resource management plan alternatives assumed implemented on BLM administered lands in western Oregon. Table 2 contains the results of the regional market equilibrium for each resource management plan theme. Results for alternatives B, D, and E were interpolations of the results of the TAMM runs for alternatives, A, C, current plans, and preferred.

Disaggregation of the Private Harvest; 1991-2000

The disaggregation of the private harvest into western Oregon subregions used Connaughton and Campbell's

[3]Other harvest sources are from forestland conversions to other uses and dead and down large material.

(1991) probability of stand harvest model. Throughout most of western Oregon, the regeneration harvest type was clearcut, the exception being the Medford subregion where the harvest was either clear cut or partial cut depending on even-aged or uneven-aged stand management. Commercial thinning treatments, if appropriate, were applied to non-regeneration harvest acres. Volumes removed from thinning contributed to the disaggregation of western Oregon's share of the TAMM private harvest.

The application of Connaughton and Campbell's (1991) model required: an updated 1990 year-end inventory, stand growth and yield projections for all private lands, and calibration for changes in federal timber policy on National Forests that occurred subsequent to the 1976-1984 period of estimation for Connaughton and Campbell's model. The calibration procedure resulted in a mechanism for adjusting the probability of stand harvest for different BLM timber supply policies. Given the same stand conditions, the higher the regional stumpage price under the BLM policy, the greater the probability of stand harvest.

Inventory and Growth Projections for Private Timberlands

The growth and yield of western Oregon's private forests were simulated by projecting future stand conditions on each of 789 field plots measured by personnel from the Pacific Northwest Research Station in 1984 and 1985, and reported in Gedney and others (1986a), (1986b), and 1987). The plots are laid out over western Oregon in a systematic grid, and each represents a specific number of acres (plot expansion factor) determined by its subregional location and ownership. The sum of the expansion factors for all projected plots in western Oregon was 5,864,163 acres. All plots were capable of producing at least 20 cubic feet per acre per year of wood suitable for log consumption and were not reserved for purposes precluding timber harvest.

Most field plots are composed of five sample points distributed over five acres, with observations on tree species, diameter, and height recorded for each point. The stands on each point were separately projected and then summed to represent forest condition for the plot. Some plots had either very young stands with no measurable volume or were yet to be regenerated, and these were projected as if a uniform number of trees of a typical species mix and number of seedlings were present on each point.

Two stand simulators were used to project the stand conditions for each inventory plot: the Stand Projection System (SPS), Version 2.3a (revised 8/1/91; Arney 1985), and the Oregon Growth Analysis and Projection System (ORGANON), Version 3.0 (Hester et al 1989). The Stand Projection System was used for plots located in all subregions except Medford and Roseburg; ORGANON was used in the latter two subregions.

Silvicultural management regimes, which are a set of activities to be carried out as the stand develops, were assigned to each plot. The regimes varied by stage of stand development (young stands, established stands) and location. Table 3 lists and summarizes the regimes, and shows the total number of acres represented by the plots assigned to each regime. The 1991-2000 disaggregation, and the 2001-2010 projection, of the private timber harvest were not heavily influenced by any management activity other than harvesting itself. Commercial thinning and fertilization both had minor effects on the results: the former because it contributed to harvest and altered stand development; the latter because it accelerated growth.

Stand conditions were updated to 1990 for land use changes and harvesting that had occurred since the plots were measured in the mid-1980's. Photo-interpretation, field checks, and county tax assessment records were used to conduct the update. Growth between the mid-1980's and 1990 was projected using either SPS or ORGANON, depending on the subregion in which the plot was located.

Calibration for Changes in Federal Timber Policies

The variables determining Connaughton and Campbell's (1991) probability of stand harvest model are the anticipated compound growth rate for the stand and the stand's growing stock volume. Both of these variables are structured as a function of the time interval within which the probability of stand harvest applies. For example, Connaughton and Campbell's model was estimated using two successive inventories; the first representing 1976 conditions, the second 1985 conditions. The logic behind Connaughton and Campbell's model is to think of a private forest landowner viewing a stand in 1976 where the stand's growing stock volume is known. The 1976 to 1985 compound growth rate becomes a surrogate for the owner's anticipated growth rate for the stand over the next 10 years.

Since the model was actually estimated for a 9 year interval (1976-1984), the estimated probability of stand harvest represents the likelihood that the owner would harvest the stand sometime during the interval. Given that the plot represents numerous like stands; the estimated probability can be thought of the proportion

of area represented by the plot that would actually be harvested within the next 9 years[4]. For each subregion, the total private harvest was computed as:

$$\text{Total Private Harvest} = \Sigma_k (P_k V_k A_k) \qquad (1)$$

where:

P_k is the estimated probability of stand harvest (a value between 0 and 1 inclusive) for the subregion's kth plot.

V_k is the volume per acre of material available for harvest for the subregion's kth plot.

A_k is the area expansion factor (acres) for the subregion's kth plot.

The private harvest was further distinguished by industrial versus non-industrial ownership.

In western Oregon, public timber supply levels are large enough that changes in offerings from National Forests or the BLM will influence stumpage price. Therefore, the estimated probabilities using the reported coefficients in Connaughton and Campbell's (1991) model imply private harvesting behavior consistent with the federal policies in effect over 1976-1984 period. Given that the model was to be applied using the 1990 growing stock and the anticipated growth rate for the 1991-2000 period[5], their reported model coefficients had to be adjusted to reflect changes in National Forest timber supply policies since the 1976-1984 period. The simplest approach was to adjust the intercept term in Connaughton and Campbell's model for assumed changes in the private harvest behavior under different federal timber supply policies. This was done by iteratively solving for the new intercept term value for Connaughton and Campbell's model such that the computed probabilities, when applied to the total private harvest formula in (1) for all subregions, would result in western Oregon's share of the TAMM private harvest for the federal policy under investigation.

[4]In application, the 9 year area proportions were extrapolated to reflect harvested acreage over a 10 year period.

[5]The anticipated growth rate was calculated as the compound growth rate bringing the 1990 stand growing stock volume to its year-end 2000 counterpart in the absence of any scheduled thinning. The rationale applied here was that the owner's anticipated growth rate, for the purposes of identifying candidate stands for final harvest, would not be based on the stand being thinned over the period as well.

For example, western Oregon's share of the TAMM projected private timber harvest for the Pacific Northwest - westside region under a federal timber supply policy reflecting new National Forest plans (*circa* 1990) and the BLM under current plans adopted in the 1980's[6] is 668 million cubic feet per year (mmcf/year). In contrast, directly applying the estimated coefficients in Connaughton and Campbell's (1991) model to the updated 1990 inventory resulted in an independent 1991-2000 private harvest projection for western Oregon of 663 mmcf/year. The 663 mmcf/year projection represents an extrapolation of the 1976-1984 private harvest behavior to the 1991-2000 period. The question then becomes: What intercept term in Connaughton and Campbell's probability of stand harvest model, when applied to the 1990 stand conditions, would give probabilities that result in a private harvest calculation from the formula in 1 equal to the TAMM derived western Oregon private harvest of 668 mmcf/year?

Figure 3 summarizes the results of the calibration procedures. The regional stumpage price serves as an indicator of the regional market equilibrium for the federal timber supply policy assumed in effect over the 1991-2000 period. In general, the private harvest does not vary too much as a result of significant price differences associated with the various federal timber supply policies represented. Therefore, only minor adjustments to the intercept term in Connaughton and Campbell's (1991) model were necessary for the private harvest disaggregation. The closeness of the Connaughton and Campbell, and the TAMM National Forest (before new plans), results in figure 3 reflect that both projections assume a similar National Forest timber supply policy for the 1991-2000 period; namely timber sale offerings at the level existing over the 1976-1984 period.

Displaying the Timber Harvest by Ownership; 1991-2000

Five ownership groups were used to portray the timber harvest outlook, by subregion, for each BLM resource management plan theme considered: the BLM, National Forests, other public, non-industrial private, and industrial private. For all BLM alternatives, the National Forest harvest levels were held constant at the allowable sale quantity for the preferred alternative in the Final Environmental Impact Statement for the northern spotted owl (table 4). National Forest and BLM allowable sale quantities were pro-rationed to western Oregon subregions using the administrative

[6]Timber Assessment Market Model (TAMM90), log run 529.

area harvest pro-rationing factors used in Greber and others (1990). The other public harvest was also held constant at the observed 1984-1988 annual average for all BLM resource management plan alternatives.

Changes in the harvest by BLM resource management plan theme were due to differing BLM allowable sale quantities across alternatives, and the unique private harvest response to each BLM resource management plan theme considered. As discussed above, the private harvest disaggregation, by subregion, was based on a 10 year accumulation of the annual TAMM projections over the 1991-2000 period and then converted to an annual harvest rate for the period. While only labelled as occurring over the 1993-2000 period, the annual private harvest actually reflects the 1991-2000 rate of harvest which included 2 years (1991 and 1992) of same BLM harvest quantity for all BLM alternatives considered since plan implementation was assumed to commence in 1993.

Reapportioning the Harvest into Log Consumption; 1991-2000

The consumption of harvested timber by processing facilities within western Oregon was calculated using an average of the 1982 log flow information reported in Howard (1984a) and the 1988 log flow information reported in Howard and Ward (1991a). These two years contrasted periods of differing economic activity; the recession in 1982 and the recovery in 1988. Both the 1982 and 1988 log flows were adjusted for the amount of western Oregon timber processed out-of-state using Howard (1984b), Howard and Ward (1991b), Larsen and others (1983) and Larsen 1992). The data was expressed as fractions representing the proportion of timber harvested in one subregion processed in other subregions (including itself).

Log consumption was calculated as follows:

$$\mathbf{q} = \mathbf{h} \cdot \mathbf{LOGFLOW}. \qquad (2)$$

where:

q denotes a vector of log consumption, where q_i represents the amount of log consumption by processing facilities located in subregion i.

LOGFLOW denotes a matrix of log flow proportions containing elements α_{ij} representing the proportion of timber harvested within subregion i processed in subregion j; where $\Sigma_j\alpha_{ij} = 1$.

h denotes a vector of timber harvest, where h_i represents the total harvest from all ownerships in subregion i.

Updating the Private Inventory; Harvest and Log Consumption 2001-2010

Acres harvested for regeneration over the 1991-2000 period were removed from the inventory and unavailable for harvest during the 2001-2010 period. Thinned acres, plus non-harvested acres not scheduled for thinning, became the acres available for harvest over the 2001-2010 period. These acres were paired with year-end 2000 yields, mid-period 2005 harvest and thinning yields (if appropriate), and year-end 2010 yields (in the absence of thinning) for application of the Connaughton and Campbell (1991) probability of stand harvest model over the 2001-2010 period.

No further adjustments to the intercept term in Connaughton and Campbell's model were made for the 2001-2010 harvest projections. The rationale was a continuation of the resource management plans assumed implemented during the 1991-2000 period. Holding the intercept term constant indicated no further change in private harvesting behavior. What did change though was the available private harvest inventory that this behavior would apply to. That is, given the change in the composition of the private inventory resulting from growth and harvest removals over the 1991-2000 period, what quantity of private harvest would occur over the 2001-2010 period using the same intercept term in Connaughton and Campbell's model used in the 1991-2000 harvest projection? Differences in the private harvest projections for the 2001-2010 period, when compared to the 1991-2000 period, reflected harvest increases (or decreases) associated with the characteristics of the year-end 2000 inventory when compared to the year-end 1990 inventory.

The procedures used to display the timber harvest and log consumption for the 1991-2000 period were the same ones used for the 2000-2010 period. The harvest quantities for the BLM, National Forests, and other public ownerships were the same as reported for the 1991-2000 period. Therefore, the aggregate annual harvest total for 2001-2010, when compared to the 1991-2000 annual total, solely reflected differences in the private harvest.

What About the Klamath Resource Area of the Lakeview District?

The Bureau of Land Management's Klamath Resource Area administered by the Lakeview District is located outside boundaries used for this analysis. Therefore, private harvest responses to differing BLM allowable sale quantities by resource management plan alternative in the vicinity of the Klamath Resource Area

(Klamath County) were not provided by this analysis. However, some effects attributable to the Klamath Resource Area were still captured by the analysis.

The TAMM regional market equilibriums did include the Klamath Resource Area allowable sale quantities as BLM harvest volume originating within the Pacific Northwest - westside region; though technically the Klamath Resource Area is located on the eastern slope of the Cascade Range. This is reasonable since there is observed log flow from Klamath County into western Oregon counties. From a regional perspective it made more sense to lump the Klamath Resource Area as part of the total BLM effect on the Pacific Northwest - westside region rather than splinter out its small allowable sale quantity and model its regional impact on TAMM's Pacific Northwest eastern supply region. Finally, how differing allowable sale quantities by resource management plan alternative on the Klamath Resource Area effected western Oregon log consumption was provided by the analysis.

Results and Discussion

Table 5 summarizes the private harvest disaggregation for the 1991-2000 period and subsequent projections for the 2001-2010 period. Furthermore, table 5 compares these results to the 1984-1988 historical baseline, as well as earlier timber availability projections contained in Sessions (1990). There is little response in the western Oregon private harvest across BLM resource management plan themes since the stumpage price - private harvest response relationship in TAMM is inelastic (see table 2 and figure 3). For western Oregon as a whole, the private harvest projections vary across BLM resource management plan themes by 15-20 million cubic feet per year (table 5). This variation is even narrower (8-10 million cubic feet per year) for the 2001-2010 period.

When compared to the 1984-1988 baseline period, the 1991-2000 private harvest disaggregation, regardless of BLM resource management plan theme, exceed the 1984-1988 baseline harvest by 100 million cubic feet per year. The increase during the 1991-2000 period reflects a private harvest response to the regional stumpage price increase that occurred between the 1984-1988 period and the 1991-2000 projection period (table 2) as a result of the reduced timber supply offerings on National Forest lands. Furthermore, these harvest increases can be attributed to increases on the non-industrial private ownership since the 1991-2000 harvest disaggregation of the industrial ownership is lower than the 1984-1988 historical baseline (table 5). The proportion of private timberland harvested over the 1991-2000 period to the total private timberland acreage available at the end of 1990, ranged from 13 to 18 percent across subregions (higher percentages to the north) and was not substantially affected by the BLM resource management plan theme being considered. Thinned acres represented 2 to 9 percent of the area of private timberland existing in 1990.

Comparison of the 2001-2010 projections with the 1991-2000 harvest disaggregation shows a dramatic increase in the total private harvest, roughly 100 million cubic feet per year (table 5). This holds for all subregions except the South Coast and Medford. The increase reflects that young, fast-growing stands, not harvested over the 1991-2000 period become attractive for harvest (in the context of the landowner behavior in Connaughton and Campbell's (1991) probability of stand harvest model) in the 2001-2010 period. One important qualification for this harvest gain is that pre-1990 forest practice rules and related environmental constraints on the private timberlands remain unchanged through 2010. The proportion of private timberland harvested over the 2001-2010 period to the total private timberland acreage available at the end of 2000, ranged from 15 to 23 percent across subregions (higher percentage to the north). The proportion of private timberland area thinned ranged from 4 to 10 percent of the total private timberland acreage not harvested by 2000.

The timber availability projections in Sessions (1990), which contained no mechanism for adjusting private harvest quantities to stumpage prices, would underestimate the private harvest disaggregation for the 1991-2000 period. In addition, the Sessions' private harvest projections for periods subsequent to the year 2000 were constrained by an even flow condition. In contrast, the 2001-2010 harvest projections from this analysis reflect the flexibility of the private ownership to harvest within all available merchantable age classes without any restrictions regarding even flow. In all likelihood, the 2001-2010 harvest quantities in this analysis would exceed the Sessions' even flow requirement.

Table 6 summarizes the log consumption results by BLM resource management plan theme for the 1993-2000 and 2001-2010 reporting periods. For comparison purposes, the total western Oregon harvest from all ownerships is shown. Western Oregon was a net importer of logs over the 1984-1988 period as total consumption exceeds harvest (table 6). This pattern was not allowed to vary in this analysis. Since log consumption was a reapportioning of the timber harvest to where the volume is consumed, differences across BLM resource management plan alternatives

were minor and reflected the inelastic private timber harvest response to the different BLM allowable sale quantities.

For all BLM resource management plan themes, log consumption in western Oregon is projected to decrease when compared to the 1984-1988 baseline period. Most of this decrease is from reduced National Forest allowable timber sale quantities. The loss in consumption would have been greater had it not been for harvest increases on private lands; especially the non-industrial ownership (table 5). By the 2001-2010 period, further increases in both the industrial and non-industrial private harvest brings consumption close to historical levels. In addition, implementing alternatives A or B on all BLM administered lands in western Oregon would provide enough harvest to restore consumption to the 1984-88 historical level (table 6).

Terminology

Allowable Sale Quantity — Planned timber sale offerings from federal lands. For the USDA Forest Service, refers to offered quantities of sawtimber convertible to lumber or plywood. For the BLM, includes sawtimber and a small component of sound chippable material.

Analysis Period — Computation periods for the analysis. Period 1 covers the period of plan implementation (1991-2000) and period 2 covers the first period thereafter (2001-2010). Results for the 1991-2000 period are converted to an annual basis and reported for the 1993-2000 period since BLM resource management plan implementation was assumed to commence in 1993.

Baseline Period — Historical period used as a reference point for comparison of projected harvests. The period chosen by the BLM was the 1984-1988 period (U. S. Department of the Interior 1988).
BLM — U. S. Department of the Interior, Bureau of Land Management, Districts of western Oregon: Coos Bay, Eugene, Medford, Roseburg, Salem, and the Klamath Falls Resource Area of the Lakeview District.

Commercial Thinning — Removal of industrial crop trees to reduce competition among remaining trees in the stand, and thereby increase growth and yield of remaining trees. For purposes of growth and yield projections, assumed to occur during the fourth decade of stand development on slopes less than 35% slope (40-45% in the Medford subregion). Minimum volume and basal area restrictions were also applied in the Medford subregion to more realistically portray commercial thinning.

Fertilization — Application of nitrogen fertilizer to forest land to increase the rate of tree growth. For the projection of growth and yield, fertilization was assumed to be applied at a rate of 200 lbs/acre for eligible plots. Eligible plots were those of medium site productivity on the industrial ownership in all subregions except Medford. Application was assumed to occur during the third decade of stand development when preceding commercial thinning, and the fifth decade of stand development when preceding clearcut.

Log consumption — Volume of timber processed by manufacturing and export facilities throughout western Oregon. Calculated as a reapportioning of the western Oregon timber harvest using log flow information in Howard (1984a) and Howard and Ward (1991a). Also includes timber processed from eastern Oregon and out-of-state origins. Manufacturing includes primary end-uses such as lumber, plywood, and other products using sound chippable material. Includes logs exported to foreign destinations from western Oregon ports.

National Forests — Western Oregon National Forests of the USDA Forest Service Pacific Northwest Region: Mt. Hood, Rogue River, Siskiyou, Siuslaw, Umpqua, and Willamette.

Ownership, Owner Groups — See definition of timber harvest below.

Pacific Northwest - Westside (PNWW) Region — That portion of Oregon and Washington west of the Cascade Range divide.

Pre-commercial Thinning — Removal of young trees with no commercial value to provide growing space for future crop trees. For the projection of growth and yield, pre-commercial thinning was assumed to occur early in second decade of stand development when 60% or more of the plot's points had a stocking of more than 350 conifers per acre; lower stocking levels were permissible for the Medford subregion. Approximately 275 trees per acre were projected to remain after pre-commercial thinning.

Private Timberland — Private forestland capable of producing 20 cubic feet per acre per year of wood suitable for log consumption and were not reserved for purposes precluding timber harvest.

Probability of Stand Harvest — Refers to the likelihood that a inventory plot (representing a stand), given its growing stock volume of harvestable material and anticipate growth, will be harvested within a 10 year period. These probabilities were estimated by adjust-

ing Connaughton and Campbell's (1991) probability of stand harvest model for different federal timber supply policies. Each probability represents the proportion of plot's area expansion harvested over the 10 year period.

Regional Market Equilibrium - A balance between the quantity of timber supplied with the quantity of timber demanded (including volume exported for out-of-region consumption) for the Pacific Northwest - westside region. The quantity of timber supplied is reported as timber harvest, while the quantity of timber demanded is reported as log consumption.

Regional Stumpage Price — The market clearing regional stumpage price (in 1967 dollars per thousand board feet) that balances timber supply and demand for the Pacific Northwest - westside region. The average value of all species of timber harvested from USDA Forest Service National Forest lands in the Pacific Northwest - westside region was used as a proxy for the regional stumpage price. See Warren 1992; deflated to 1967 dollars per thousand board feet, Scribner. using the producer price index, all commodities (1967=100) reported in Ulrich (1988) and (1990).

Resource Management Plan Theme — Refers to the implementation of similar resource management plan alternatives on all BLM administered lands in western Oregon. The themes correspond to Alternatives A-E, current plans, and the Preferred alternative.

Stand Conditions — Refers to the per acre quantity (million cubic feet) of harvestable material on an inventory plot, or stand represented by an inventory plot. Also includes the compound rate growth over a specified 10 year period.

Subregion — Geographically defined reporting areas for timber supply and log consumption. They are defined to closely approximate the local areas proximate to BLM District boundaries. See figure 1 and table 1.

Timber Assessment Market Model (TAMM) — A supply and demand equilibrium model that provides 50 year projections of consumption, production, and prices of forest products and stumpage under an array of externally specified conditions on policy and the economic environment surrounding the forest sector (see Adams and Haynes 1980, Haynes and Adams 1985, and Haynes 1990).

Timber Demand — An inverse stumpage price - quantity relationship for logs. Timber demand is determined by factors outside the control of the BLM or any other forest land ownership category. This analysis accounts for timber demand in the regional market equilibriums calculated using the Timber Assessment Market Model.

Timber Harvest — Timber harvest is distinct from timber supply in that harvest represents tree volume removed from growing stock inventory and converted into primary end uses such as lumber, plywood, and other products using sound chippable material. Reported on an annual basis. Definitions by ownership groups are as follows:

Source of Change

BLM - USDI Bureau of Land Management planned 10 year allowable sale quantity for the Coos Bay, Eugene, Medford, Roseburg, and Salem Districts; and the Klamath Resource Area of the Lakeview District. Varies by resource management plan theme. Includes sawtimber and sound chippable material.

Estimated by the Analysis

Industrial - Ownership class of private lands owned by companies or individuals operating wood using plants. Also includes large corporate owners who manage lands for timber production but do not own or operate wood using plants. Harvest refers to net merchantable growing stock removals.

Non-Industrial Private - Ownership of private lands that does not meet the industrial classification. Includes small woodland owners and farmers. Harvest refers to net merchantable growing stock removals.

Held Constant Across all BLM Resource Management Plan Themes

National Forest - USDA Forest Service planned 10 year allowable sale quantity for Oregon National Forests west of the Cascade Range Divide (see table 4). This quantity only includes sawtimber material suitable for lumber or plywood manufacture.

Other Public - Observed 1984-1988 timber harvest from local, state, and federal (excluding BLM and National Forest) timberlands.

Timber Supply — Timber supply is a schedule of what quantity of trees may be removed given ownership policies, available inventory, and stumpage price. Timber harvest is an observable consequence of timber supply. Public forest owners were assumed to

have an inelastic timber supply schedule not responsive to stumpage price.

USDA Forest Service — U. S. Department of Agriculture, Forest Service.

Supporting Data

Actual 1991 and 1992 BLM Harvest — Used to initialize the TAMM projections for the actual level of BLM timber harvest for the first two years of the 1991-2000 analysis period. The 1992 harvest is an extrapolation of the observed harvest through March 1992. ***Source:*** USDI Bureau of Land Management, Portland, Oregon.

BLM Allowable Sale Quantities — Planned allowable sale quantities by western Oregon District for each resource management plan theme. ***Source:*** USDI Bureau of Land Management, Portland, Oregon.

BLM Chip Proportions — Proportion of BLM allowable sale quantity in sound chippable material. Used to convert reported BLM allowable sale quantities into sawtimber component since it is the sawtimber component that is necessary for input into TAMM. ***Source:*** USDI Bureau of Land Management, Portland, Oregon.

Exogenous Consumption — Logflow from the following county origins and processed within western Oregon subregions were held constant throughout the analysis: 1) Klamath county origin, 2) Other eastern Oregon counties, and 3) Out-of-State county origin. Annual volumes were the average of the 1982 and 1988 reported log flows from these origins into western Oregon. ***Source:*** Howard 1984a, Howard and Franklin 1991a.

Log Flows — Used to calculate log flow proportions used in log consumption calculations. ***Source:*** Larsen and others (1983), Howard (1984a), Howard (1984b), Howard and Ward (1991a), Howard and Ward (1991b), and Larsen (1992).

National Forest Allowable Sale Quantities — USDA Forest Service planned 10 year allowable sale quantity in million cubic feet per year. This quantity only includes sawtimber material suitable for lumber or plywood manufacture. This sale quantity assumes implementation of the Interagency Scientific Committee's conservation strategy for the northern spotted owl as indicated in the Final Environmental Impact Statement for the northern spotted owl (U. S. Department of Agriculture 1992a and 1992b). See table 4. ***Source:*** USDA Forest Service, Pacific Northwest Region, Portland, Oregon.

National Forest and BLM District Administrative Area Harvest Pro-rationing Factors — Represents the proportion of allowable sale quantity from an administrative unit (e.g., National Forest, BLM District) occurring within the boundaries of a particular subregion. ***Source:*** Adapted from supplemental information used in Greber and others (1990).

Other Public Harvest — Annual average for the 1984-1988 period as reported in the Oregon timber harvest reports (Oregon Forestry [1986], Oregon State Department of Forestry [1985, 1987], Oregon State Forestry Dept. [1988, 1989]). Converted to million cubic feet per year.

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Table 1: Subregion definitions for western Oregon.

SUBREGION	WESTERN OREGON COUNTIES	REPORTING AREA FOR BLM DISTRICT
North Coast	*Clatsop, Columbia, Tillamook, Washington.*	Salem District
Central Coast	*Benton, Lincoln, Polk, Yamhill.*	Salem District
North Willamette	*Clackamas, Multnomah, Hood River.*	Salem District
Mid-Willamette	*Linn, Marion.*	Salem District
Eugene	*Lane.*	Eugene District
Roseburg	*Interior Douglas*(1)*.*	Roseburg District
South Coast	*Coos, Curry, and Coastal Douglas.*	Coos Bay District
Medford	*Jackson, Josephine.*	Medford District

Notes:

(1)The division between Coastal and Interior Douglas County follows the Coos Bay District boundary in Douglas County.

Table 2: Regional market equilibrium results by BLM resource management plan theme.

Bureau of Land Management		TAMM Equilibrium Results	
Resource Management Plan Theme	Allowable Sawtimber Sale Quantity (mmcf/year)	1991-2000 Regional Stumpage Price (1967 $/mbf)	1993-2000 Western Oregon Private Growing Stock Removals (million cubic feet per year)
1984-1988 Historical	197	$37.56	602
NO ACTION(1)	186	$74.22	689
A(2)	245	$70.03	679
B	221	$71.66	682
C(3)	66	$82.07	704
D	77	$81.54	703
E	55	$82.87	706
PREFERRED(4)	94	$80.18	700

mbf- thousand board feet, long log scale.
mmcf/year - million cubic feet per year.

Notes:

(1) Timber Assessment Market Model (TAMM90), log run 582.
(2) Timber Assessment Market Model (TAMM90), log run 583.
(3) Timber Assessment Market Model (TAMM90), log run 584.
(4) Timber Assessment Market Model (TAMM90), log run 587.

Table 3: Silvicultural management regimes used for projecting growth and yield for private lands in western Oregon.

Name of Regime	Acres Assigned To Regime	Management Activities	Comments
RX1, RX1A	2,245,471	Clearcut.	Applied to established stands not eligible for or needing other activities; RX1A allows fertilizer on industrial land in decade prior to clearcut
RX2, RX2B	1,149,234	Commercial Thinning, Clearcut	Applied to established stands that have sufficient stocking to benefit from commercial thinning; RX2B allows fertilization on industrial land prior to both thinning and clearcut.
RX3, RX3A	471,345	Pre-commercial Thinning Clearcut.	Applied to young stands that would benefit from stocking control; generally on ground too steep for commercial thinning; RX3A allows fertilization prior to clearcut on industrial lands.
RX4, RX4B	544,904	Pre-commercial and Commercial Thinning, Clearcut.	Applied to young stands that would benefit from stocking control and then benefit from commercial thinning prior to clearcut; RX4B allows fertilization prior to commercial thinning and clearcut on industrial lands.
RRX1	30,641	Establish Stand, Clearcut.	Applies to bare land or newly regenerated stands, typically on low sites.
RRX3, RRX3A	177,794	Establish Stand, Pre-commercial Thinning, Clearcut.	Applies to bare land or newly regenerated stands typically on ground too steep for commercial thinning; RRX3A allows for fertilizer on industrial ownership prior to clearcut.
RRX4, RRX4B	558,221	Establish Stand, Pre-commercial and Commercial Thinning, Clearcut.	Applies to bare land or newly regenerated stands suitable for both pre-commercial and commercial thinning; RRX4B allows fertilizer on industrial ownership prior to commercial thinning and clearcut.
SWRX1	416,932	Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX1 except allows for a partial cut or clearcut as the regeneration harvest.
SWRX2	78,202	Commercial Thinning, Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX2 allows for a partial cut or clearcut as the except regeneration harvest.
SWRX3	50,320	Pre-commercial Thinning, Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX3 allows for a except partial cut or clearcut as the regeneration harvest.
SWRX4	8,387	Pre-commercial and Commercial Thinning, Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX4 except allows for a partial cut or clearcut as the regeneration harvest.
SWRX5	68,908	Brush Control Clearcut/Partial Cut.	Applied only in Medford subregion; calls for brush control whenever stand is ineligible for pre-commercial thinning and 25% or more of trees are hardwoods.
None	63,779	Not Projected.	Site not suitable for conifer growing stock or other factors precluding management.

Table 5: Results for the 1993-2000 private harvest disaggregation and 2001-2010 projection by BLM resource management plan theme.

BLM Resource Management Plan Theme	1993-2000 IND	1993-2000 NIPF	1993-2000 TOTAL	2001-2010 IND	2001-2010 NIPF	2001-2010 TOTAL
	Private Harvest, Western Oregon (million cubic feet per year)					
Preferred Alternative (BLM ASQ = 96)	507	193	700	580	226	806
Current Plans (BLM ASQ = 190)	499	190	689	576	223	799
Alternative A (BLM ASQ = 251)	492	187	679	574	220	794
Alternative B (BLM ASQ = 227)	495	187	682	574	223	797
Alternative C (BLM ASQ = 68)	510	194	704	581	226	807
Alternative D (BLM ASQ = 76)	509	194	703	581	226	807
Alternative E (BLM ASQ = 56)	511	195	706	582	226	808
Timber Availability[1] (BLM ASQ = 190)	**544**	**125**	**669**	**557**	**125**	**682**

	IND	NIPF	TOTAL
1984-1988 Baseline (BLM Harvest = 202)	525	77	602

Notes:
- IND - Private industrial ownership.
- NIPF - Private non-industrial ownership.
- BLM ASQ - Bureau of Land Management resource management plans cumulative allowable sale quantity for western Oregon (million cubic feet per year). Includes the Klamath Resource Area of the Lakeview District.
- BLM Harvest - Bureau of Land Management actual harvest (million cubic feet per year).

(1) Sessions (1990).

Table 6: Log consumption results by BLM resource management plan theme.

BLM Resource Management Plan Theme	Log Consumption by Western Oregon Processing Facilities (million cubic feet per year) 1993-2000				2001-2010			
	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP	HARV CNSMP	END CNSMP	EXOG CNSMP	TOTAL
Preferred Alternative	1,034	990	169	1,159	1,139	1,086	169	1,255
Current Plans	1,114	1,069	172	1,241	1,225	1,170	172	1,342
Alternative A	1,166	1,118	171	1,289	1,281	1,224	171	1,395
Alternative B	1,144	1,098	171	1,269	1,258	1,203	170	1,373
Alternative C	1,009	966	169	1,135	1,113	1,061	168	1,229
Alternative D	1,015	972	170	1,142	1,120	1,067	170	1,237
Alternative E	1,000	956	168	1,124	1,102	1,050	168	1,218

	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP
1984-1988 Baseline	1,248	1,196	172	1,368

Notes:

HARV - Total harvest from all ownerships within western Oregon (million cubic feet per year).

END CNSMP - Consumption of logs originating from ownerships within western Oregon (million cubic feet per year). The difference between HARV and END CNSMP represents the volume of timber originating in western Oregon, but processed by out-of-state or eastern Oregon mills.

EXOG CNSMP - Consumption of logs originating from ownerships from eastern Oregon and out-of-state (million cubic feet per year). Differences reflect the effect of implementing different BLM resource management plan alternatives on Klamath Resource Area of the Lakeview District in eastern Oregon.

TOTAL CNSMP - Total log consumption (all origins) by western Oregon processing facilities (million cubic feet per year).

Salem District Timber Harvest (1993–2000) per Year – Millions of Cubic Feet (MMCF) per Year

Supplier [1/]	1984–88 Baseline	Alternative No Action	A	B	C	D	E	Preferred
BLM [2/]	40	37	52	44	17	17	20	22
USFS [3/]	138	53	53	53	53	53	53	53
Private (industrial & non–industrial)	289	367	361	363	375	374	376	373
Other Public	47	47	47	47	47	47	47	47
Total	514	504	513	506	492	491	496	494

Data source: Non–BLM harvest projections from Timber Supply Analysis for BLM Planning, USDA–USFS, PNW Research Station, Portland, OR, 1992.

Salem District Timber Harvest (2001–2010) – Millions of Cubic Feet (MMCF) per Year

	1984–88 Baseline	No Action	A	B	C	D	E	Preferred
Total	514	583	595	588	566	566	570	570

Data source: Non–BLM harvest projections from Timber Supply Analysis for BLM Planning, USDA–USFS, PNW Research Station, Portland, OR, 1992.

Salem District Timber Processed (1993–2000) – Millions of Cubic Feet (MMCF) per Year

	1984–88 Baseline	No Action	A	B	C	D	E	Preferred
Total	518	505	515	509	492	492	496	495

Note: (1) Timber Processed from all sources was partitioned on county boundaries to approximate the BLM District. (2) This analysis accounts for historic patterns of log flows across county boundaries. (3) Assumes all BLM districts have implemented the same alternative. (4) Includes logs exported overseas.

Data Source: Timber Supply Analysis for BLM Planning, USDA–USFS, PNW Research Station, Portland, OR, 1992.

1/ Non–BLM supply partitioned on county boundaries to approximate BLM District.

2/ Baseline data from BLM Facts, USDI–BLM. Converted from board feet using a factor of 6.2 bd. ft. per cu. ft.

3/ Assumes implementation of most recent land management plans.

Western Oregon Timber Harvest (1993–2000) per Year – Millions of Cubic Feet (MMCF) per Year [1/]

Supplier	1984–88 Baseline	Alternative No Action	A	B	C	D	E	Preferred
BLM	199	187	250	226	67	74	55	96
USFS [2/]	377	175	175	175	175	175	175	175
Private (industrial & non–industrial)	602	689	679	682	704	703	706	700
Other Public	64	64	64	64	64	64	64	64
Total	1243	1114	1167	1144	1009	1014	998	1034

Data source: Non–BLM harvest projections from Timber Supply Analysis for BLM Planning, USDA–USFS, PNW Research Station, Portland, OR, 1992.

Western Oregon Timber Harvest (2001–2010) – Millions of Cubic Feet (MMCF) per Year

Total	1243	1224	1281	1259	1113	1122	1103	1140

Data source: Non–BLM harvest projections from Timber Supply Analysis for BLM Planning, USDA–USFS, PNW Research Station, Portland, OR, 1992.

Western Oregon Timber Processed (1993–2000) – Millions of Cubic Feet (MMCF) per Year

Total	1294	1166	1216	1195	1063	1069	1053	1087

Note: (1) Timber Processed from all sources was partitioned on county boundaries to approximate BLM Districts, with the exception of the coastal portion of Douglas County which was included in Coos Bay District. (2) This analysis accounts for historic patterns of log flows across county boundaries. (3) Assumes all BLM districts have implemented the same alternative. (4) Includes logs exported overseas.

Data Source: Timber Supply Analysis for BLM Planning, USDA–USFS, PNW Research Station, Portland, OR, 1992.

[1/] Totals do not include Klamath Falls Resource Area.

[2/] Assumes implementation of most recent land management plans.

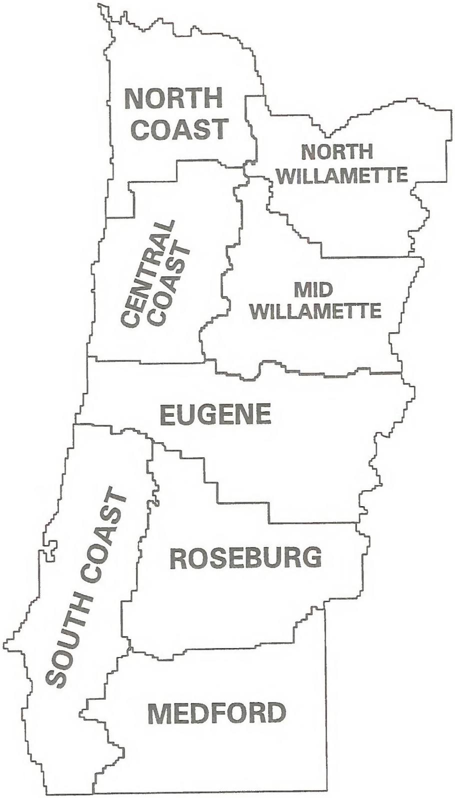

Figure 1: Western Oregon subregions.

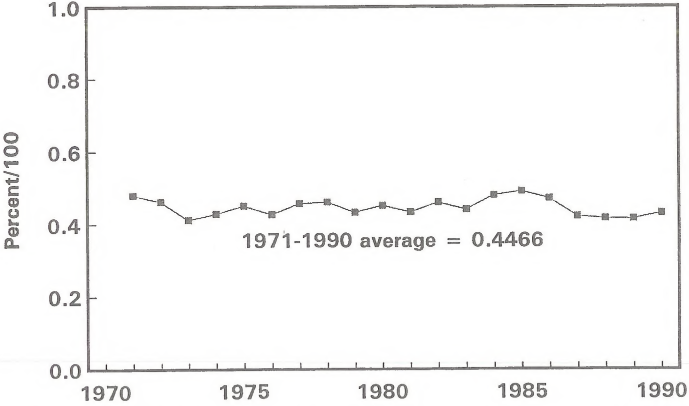

Figure 2: Western Oregon private timber harvest as a proportion of the Pacific Northwest - westside private harvest total.

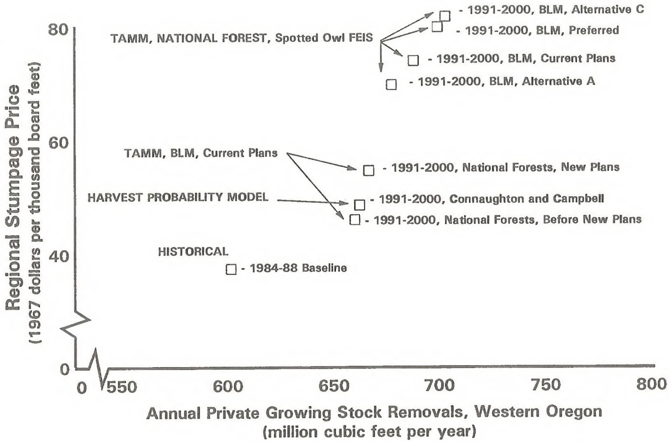

Figure 3: Private harvest calibration for changes in federal timber policy.

Appendix 4-N Reasonably Foreseeable Scenario for Mineral Exploration and Development Potential in the Salem District Planning Area

Oil and Gas

Economic conditions dramatically affect drilling activity, and at the present time oil and gas markets are depressed. An upturn in the petroleum market, however, could create a significant increase in the number of wells drilled within the planning area as a great portion of the area has moderate to high oil and gas potential. The following sections briefly describe the planning area's historical, present and reasonably foreseeable oil and gas activity.

Prospectively Valuable for Oil and Gas

Most of the land within the Coast Range and Willamette Valley is classified as prospectively valuable (PV). PV criteria include a minimum thickness of 1,000 feet of sedimentary rocks at depths no greater than 35,000 feet below the surface, a favorable structural setting, and direct or indirect evidence of oil and gas potential, such as oil seeps, oil and/or gas shows in test wells, past or present production, seismic information, similarity with known producing rocks, or acceptable levels of thermal maturation.

Oil and Gas Potential

Oil and gas potential rating criteria are described in chapter 3. In general, areas of production, areas being explored or leased, and some surrounding PV lands are considered to have high potential. Areas marginal to these sites which meet criteria for classification as prospectively valuable for oil and gas are rated as moderate potential. Areas not designated as PV are rated as having low potential.

Historical and Current Background

The planning area has a long history of oil and gas exploration. The only commercial production to date in the planning area has been from reservoirs in Eocene sandstones at the Mist gas field. Exploratory drilling in the Mist area of northwestern Oregon began in 1945 and eventually led to the discovery of the Mist gas field.

The Mist field is located on a faulted, northwest-trending anticline about 70 Km (45 mi) northwest of Portland. The field was discovered in 1979 (after several dry holes with shows of gas but no oil) by partners Reichhold Energy Corporation, Diamond Shamrock Corporation, and Northwest Natural Gas Company. While Reichhold and Diamond Shamrock were pursuing a commercial gas discovery, Northwest Natural Gas was more interested in finding a gas storage site for pipeline gas.

After eleven years of development drilling, the success ratio is about one in four, with over 40 pools discovered by the end of 1991. Production is generally from depths of 1,500-2,500 feet, with a total field production of 41 Bcf. The gas sand is about 600 feet thick, with 20 feet to 150 feet of gas.

Reservoir rock are the permeable sandstones of the upper Eocene Cowlitz Formation, the Clark and Wilson Sandstone. A shallow sand above this reservoir also has produced gas in several wells, and a deeper sand also has gas potential. The trapping conditions at Mist are complex. Most of the gas pools are in fault traps on a large anticlinal structure. However, at least one gas pool occurs in a shale encased sandstone, a pure stratigraphic trap. Tuffaceous deep water shales of the upper Cowlitz and Keasey Formations overlie the gas-producing reservoir sandstones and serve as impermeable sealing beds. The source of the gas at Mist is still under debate. The Mist gas is very dry and isotopically light; its composition suggests that it was thermally generated. While no oil has been reported from the Mist field, minor shows of oil and gas were reported from a well drilled southeast and downdip from Mist (Exxon Corp. GPE Federal Com 1).

Two depleted gas pools at Mist have been converted to gas storage. Northwest Natural Gas Company has drilled nine injection wells and thirteen monitor wells in two pools and uses the facility to store up to 10 Bcf for peak demand periods. The field has therefore evolved to fulfill intentions of both its early explorers, production and gas storage.

The USGS includes Tertiary strata in all of western Oregon and Washington in their gas play. The play is based on the assumption that the Mist gas field is an analog for all undiscovered hydrocarbon accumulations larger than 1 million barrels of oil or 6 billion cubic feet of gas.

To provide transport of the gas to market, pipelines from the Mist gas field tie into the main line at Clatskanie, and the new south Mist feeder pipeline to the Portland metropolitan area.

A 1981 discovery in the central Willamette basin produced a total of 10 million cubic feet of gas from Eocene rocks. This discovery, the Lebanon gas field, represents a significant show of gas, and was a positive sign for future potential of the basin. Discovery has not been followed by much further drilling. About 40 wells have been drilled in the basin, but well density is still very low.

Present Activity

Presently, exploration is proceeding in the Mist Gas Field. In spite of low gas prices in 1991, five exploratory wells were drilled and one redrill resulting in the discovery of three new gas pools. In addition, two more injection-withdrawal service wells were drilled at the Mist Natural Gas Storage Project.

Reasonably Foreseeable Future Scenario

Based on the preceding analysis of past and current oil and gas activities and trends, the following is a description of the reasonably foreseeable oil and gas exploration and development activity anticipated in the planning area over the next 10-15 years.

Geophysical Exploration

Geophysical work reached a peak in the Mist Gas Field in 1985. From 1980 to 1990, 10 geophysical notices were processed by the BLM for operations on federal lands. Most of the notices were for areas east of the Mist Gas Field near the town of Scappoose.

During the next 15 years, an average of about one geophysical project per year is estimated within the planning area, and geophysical work will continue as drilling prospects are defined. Most of these would probably involve seismic methods. Projects would involve several lines typically 3-30 miles in length, with most activity taking place on existing rights-of-way. It is estimated that about 95 percent of all activity will take place on private and county lands. There are only two small parcels of federal land within the Mist gas field. Most of the federal land is to the east.

General Oil and Gas Drilling Activity

Future exploration would probably occur to the east, northeast, south, and west of the Mist gas field. well depths probably continuing in the 1,500 to 3,000 foot range, although the basin may become significantly deeper to the east. Even if the economics become more favorable, the exploration rate would probably continue at about the same as at present with step out wells from the Mist gas field.

Based on past activity and professional judgment, it is reasonable to expect the activity from the 1980s would continue into the 1990s. More than 200 wells had been drilled in Oregon and 5 of them at Mist before the Mist gas field was discovered. Since the gas field was discovered in 1979, approximately 120 wells have been drilled during the first 10 years of commercial production. One well, the Exxon Corp. GPE Federal Com. 1 was drilled on federal land in 1985 east of the Mist gas field.

Unless gas price or demand increases substantially, about 5-7 wells per year are expected during the next fifteen years.

Most wells at Mist require a flat well pad of 100 feet by 200 feet. Wells in the Mist field are generally located near existing public roads or logging roads, but sometimes additional gravel or new roads must be added to reach a site. Each of these sites would create an estimated .5 acre of surface disturbance for drill pads, and .5 acre each for access. Total disturbance, assuming 7 wells a year for 15 years would be up to 105 acres. Most exploratory and production drilling occurs on private or county lands (95 percent), so federal surface disturbance might only involve a maximum of 5 acres. Sites are reclaimed when drilling and production operations are concluded.

If another gas field is discovered, possibly 5-40 wells might be needed, involving about 10-80 acres disturbance. This would include about 5-40 acres for drill pads and access roads, and 5-10 acres for pipeline construction within the field. The amount of disturbance to connect the field with an existing pipeline would vary depending on its location within the planning area. Given the land ownership pattern, a field would typically involve no more than about 50 percent federal ownership, resulting in an estimated surface disturbance of about 5-40 acres on federal lands.

Future exploration does not necessarily mean that producing wells will be discovered. Only a small percentage of exploratory wells in the planning area have been completed as producers.

Recent economic conditions within the oil industry resulted in a sharp decline in the number of active exploratory wells and the number of developmental wells. A turn around in the oil industry or an increase in the price of oil purchased from abroad would spur an increase in oil and gas activity in the planning area. Continued low oil and gas prices and depressed economic conditions would result in a continued low level of domestic exploration and development.

Gas Production

The state of Oregon sets spacing unit sizes for the production of gas. Although the federal government is not bound by these spacing unit sizes, they are generally recognized. The spacing units are intended to prevent waste and conserve the resource. Statewide spacing units are surveyed sections, or quarter sections, or quarter-quarter sections. For gas production shallower than 7,000 feet, a maximum of one producing well may exist on a 160-acre quarter section. For gas production from deeper than 7,000 feet, one producer may exist on each 640 acres or a section. The well location for purposes of spacing is the location of the well bore at the top of the producing horizon and must be at least 500 feet from the spacing unit boundary. Special field rules in the Mist field, however, allow a setback distance of 250 feet from the spacing unit boundary to allow a more effective search for the small pools that characterize the field. The unit sizes are the same as for statewide spacing and apply to each pool. More than one well could be drilled in a quarter section, for example, if each produced from a different pool.

Oil Production

Although no oil field discoveries are expected within the planning area, wells drilled during gas exploration will continue to be evaluated for possible oil production. This is because maturation studies of source rock demonstrate the area to be a gas province, as is the case of the Mist Gas Field.

Appendix 4-O
1990s Estimated Harvest Acres within 1/2-mile of 1 to 20- Acre Zoned Areas

RIA T.	R.	BLM acres	Estimated Harvest Acres A	B	C	D	E	PA
2 N.	2 W.	320	0	0	0	62	0	69
2 N.	3 W.	100	0	0	15	0	0	0
3 N.	2 W.	514	57	57	0	73	54	204
4 N.	2 W.	162	0	0	0	7	0	65
4 N.	3 W.	191	0	0	14	15	0	0
1 S.	5 E.	249	57	51	43	35	20	24
1 S.	5 W.	232	62	0	0	57	0	57
1 S.	8 W.	2,157	420	407	0	166	105	0
1 S.	9 W.	602	207	251	117	142	152	0
2 S.	4 E.	490	0	0	0	16	0	0
2 S.	5 E.	199	0	0	0	0	44	0
2 S.	6 E.	1,531	401	89	0	221	38	54
2 S.	5 W.	613	0	44	236	121	100	0
3 S.	3 E.	1,153	16	22	3	8	6	27
3 S.	5 W.	969	71	133	15	0	39	103
3 S.	8 W.	204	45	44	64	0	23	0
3 S.	9 W.	206	29	29	85	0	0	68
4 S.	3 E.	1,151	31	59	0	120	33	27
4 S.	4 E.	320	0	0	0	6	0	0
4 S.	5 W.	280	43	4	0	0	3	0
4 S.	6 W.	592	4	15	16	15	14	0
5 S.	2 E.	258	0	0	0	29	0	0
5 S.	3 E.	53	0	0	0	6	0	6
5 S.	7 W.	1,236	5	38	10	24	3	6
6 S.	1 E.	179	0	0	0	7	0	8
6 S.	2 E.	1,950	111	87	58	111	77	32
8 S.	3 E.	13	0	0	0	5	0	0
8 S.	4 E.	211	0	0	0	2	37	3
9 S.	1 E.	53	26	26	28	0	0	0
9 S.	2 E.	1,116	51	52	116	48	87	90
9 S.	3 E.	1,278	0	0	8	10	63	100
9 S.	10 W.	16	11	11	0	10	7	11
9 S.	11 W.	39	9	9	0	0	0	9
10 S.	1 E.	2,070	0	0	142	35	79	90
10 S.	2 E.	2,248	25	0	0	43	71	20
10 S.	10 W.	21	20	21	0	0	16	19
11 S.	1 E.	1,094	0	0	0	27	14	46
13 S.	7 W.	1,939	46	36	55	31	0	0
13 S.	8 W.	81	0	34	32	0	0	0
13 S.	11 W.	71	0	0	0	15	0	12
14 S.	7 W.	1,284	192	176	21	120	0	62
14 S.	8 W.	3,778	1,180	864	271	169	510	159
14 S.	9 W.	435	100	123	13	0	67	25
15 S.	8 W.	1,412	54	245	80	0	277	22
15 S.	9 W.	130	30	30	0	0	29	0
Total			3,304	2,960	1,442	1,756	1,968	1,451

Source: WODDB and 10-Year Timber Harvest Scenarios

Appendix 4-P Consistency of the Proposed Action and Alternatives with State of Oregon Wildlife Plans

State Plan/Statute	Objective	Consistency of Alternatives
Oregon Statutory Wildlife Policy, Revised Statute 496.012	Maintain all species of wildlife at optimum levels and prevent the serious depletion of any indigenous species.	Alternatives NA, A, and B could lead to substantial depletion of those populations of species heavily dependent on older forest habitat that occupy BLM-administered lands in the planning area (see following discussions of threatened and endangered species and sensitive species). Several alternatives may maintain other populations at less than optimum (see later discussion of big game management objectives).
	Develop and manage the lands and waters of the state in a manner that will enhance the production and public enjoyment of wildlife.	Public access would be greatest in alternatives NA, A, and B and more limited by road closures in alternatives C, D, and E.
	Develop and maintain public access to the lands and waters of the state and the wildlife resources thereon.	
	Regulate wildlife populations and public enjoyment of wildlife in a manner that is compatible with primary uses of the lands and waters of the state and provide optimum public recreational benefits.	
Oregon Threatened and Endangered Species Act	Protect and conserve wildlife species that are determined to be threatened or endangered.	All state-listed species (T&E) found on BLM-administered land in the Salem district are also federally listed under the Endangered Species Act. As such, these species will be protected under the requirements and provisions of the Act.
Oregon's Sensitive Species Rule	Help prevent species from qualifying for listing as threatened or endangered.	Most species on Oregon's sensitive species list would be protected well under alternatives C, D, E, and PA, but many may not be well protected under alternatives NA, A, and B.

Appendix 4-P Consistency of the Proposed Action and Alternatives with State of Oregon Wildlife Plans (Cont'd.)

State Plan/Statute	Objective	Consistency of Alternatives
Nongame Wildlife Plan	Maintain populations of naturally occurring Oregon nongame wildlife at self-sustaining levels within natural geographic ranges in a manner which provides for optimum recreational, scientific, and cultural benefits and, where possible, is consistent with primary uses of lands and waters of the state.	See preceding discussions.
Big Game Population Management Objectives	Develop, restore, and/or maintain big game (along with associated recreational, aesthetic, and commercial opportunities and benefits) at the level identified in 1980 as the planning target level by game management unit. This is accomplished through hunting season regulation and implementation of multiple-use management practices on public lands that tend to stabilize the cover-forage relationship in space and time, provide for a wildlife emphasis in management of sensitive wintering areas, and offer habitat improvement opportunities.	Under alternatives NA, A, and B, elk habitat effectiveness on BLM-administered lands would decline. Optimal thermal cover would be enhanced in prescribed areas under alternative C, D, E, and the PA and would decline under other alternatives. Proposed road construction would be highest under alternative C and the PA. All alternatives provide for forage seeding. Road closures in all alternatives would improve habitat for elk.
Wild Fish Policy	Protect and enhance wild stocks.	In the short term, no alternative would change habitat conditions on many already designated streams enough to protect existing stocks with certainty. In the long term, all alternatives would protect streams sufficiently to protect wild stocks and all but alternative A would provide sufficient stream habitat protection to contribute to their enhancement.

Appendix 4-P Consistency of the Proposed Action and Alternatives with State of Oregon Wildlife Plans (Cont'd.)

State Plan/Statute	Objective	Consistency of Alternatives
Coho, Steelhead, and Trout Plans	Maintain and enhance production.	Similar to wild stocks. See preceding.
Basin Fish Management Plans	Establish compatible objectives for management of all fish stocks in each basin. Present tasks for attaining objectives, describe unacceptable management strategies, and set priorities on achievement.	Similar to wild stocks. See preceding. Unacceptable management strategies defined mostly by omission.
Oregon Forest practices Act rules	Establish minimum standards which encourage and enhance the growing and harvesting of trees while considering and protecting other environmental resources such as air, water, soil, and wildlife.	See appendix 4-Q, item 2.

Appendix 4-Q Consistency of the Plan Alternatives with the Forestry Program for Oregon (FPFO) (Continued)

FPFO Objective	Consistency of Alternatives
1. Forest Land Use. Preserve the forest land base of Oregon: Stabilize the present commercial forest land base. Manage habitat based on sound research data and the recognition that forests are dynamic and most forest uses are compatible over time.	All alternatives preserve most of the forest land administered by BLM, while allowing for some conversion of forest to accommodate expansion of transportation, power and communication facilities. All alternatives also allow for exchange and/or sale of some forest lands, which could lead to their conversion to nonforest uses if local land-use plans permit. Land that would be managed for commercial forest products ranges from a high of 311,000 acres under alternative A to a low of 161,800 acres under alternative D. Only alternatives NA, and A maintain at least the 287,900 acres currently allocated to commercial forest production. The PA allocates 283,600 acres to commercial forest production. Alternatives C, D, and E allocate substantial acreage to management of habitats to the exclusion of timber production. The allocation of such land in alternative D is most explicitly based on current research data. Alternatives NA, B, and C place varying degrees of emphasis on compatibility of forest uses.
2. Forest Practices. Assure practical forest practices that conserve and protect soil productivity and air and water quality: Promote forest practices that maintain Oregon's forest values, including forest tree species, fish and wildlife, soil productivity, and air and water quality. The Forest Practices Act and rules are one vehicle for accomplishing this.	All alternatives provide for the use of practical forest practices that meet this goal and, with some exceptions, meet or exceed the requirements of the Oregon Forest Practices Act and rules and the Oregon Smoke Management Plan. Specific exceptions are: (1) possible inconsistency of all alternatives except C, with the clear cut proximity requirement of section 4 of the act as revised in 1991; these alternatives would be consistent with the basic objectives of the act and rules; (2) inconsistency of alternative A with the snag/wildlife tree retention requirement and the scenic highway visual protection requirement of revised section 5 of the act; (3) possible inconsistency of alternatives NA, A, B, and C with the rule requiring maintenance of 70 acres of suitable habitat encompassing each spotted owl nest site; and (4) inconsistency of all alternatives except E with the 1991 interim rule regarding protection of intermittent streams that have a direct confluence with a class I stream. Since the 1991 interim rules are scheduled to be superseded by new rules by September 1, 1992, the preferred alternative for the proposed RMP/final EIS can be conformed to those new rules.

Appendix 4-Q Consistency of the Plan Alternatives with the Forestry Program for Oregon (FPFO) (Continued)

FPFO Objective	Consistency of Alternatives
3. Timber Growth and Harvest. Promote the maximum level of sustainable timber growth and harvest on all forest lands available for timber production, consistent with applicable laws and regulations and taking into consideration landowner objectives.	Each alternative provides for the use of intensive forest management practices to promote timber growth and harvest on all forest lands allocated as available for such intensive management, consistent with the alternatives' goals and objectives. Each alternative considers the application of such practices, even where they may be uneconomic, for the potential purpose of promoting timber growth and harvest.
4. Recreation, Fish and Wildlife, Grazing, and Other Forest Uses. Encourage appropriate opportunities for other forest uses, such as fish and wildlife habitat, grazing, recreation and scenic values on all forest lands, consistent with landowner objectives: A full range of recreation opportunities is encouraged. Where needed to reduce harassment and/or overharvest of wildlife, road closure programs are supported.	Each alternative provides opportunities for other forest uses, consistent with the alternatives' goals and objectives. Although all alternatives provide a full range of recreational opportunities, the emphasis of the alternatives varies. Alternative A limits the number of developed recreation sites maintained. Alternatives D and E emphasize nonmotorized recreation opportunities. Road closures to protect wildlife habitat and other values are proposed in all alternatives except NA.
5. Forest Protection. Devise and use environmentally sound and economically efficient strategies to protect Oregon's forests from wildfire, insects, disease, and other damaging agents: Use integrated pest management. Minimize total cost plus loss resulting from wildfire. Employ cost-effective fire management policies that emphasize planned ignition fires over natural ignition fires and that consider impacts to the state's forest fire protection program.	Under all alternatives, economically efficient protection strategies would be employed, and integrated pest management would be used. Minimizing total cost plus loss from wildfire would be integral. Planned-ignition prescribed fires would be emphasized over natural-ignition prescribed fires, but the latter could be used to achieve resource and fire management objectives. Cooperation with other fire suppression agencies, including state and local agencies, would help assure cost-effective fire protection and suppression by all parties. Alternatives D and E would provide less efficient protection from wildfire than the other alternatives, however, as their lower intensity of timber management in rural interface areas would increase both the risk of wildfire and the cost of suppression.

Appendix 4-R - Relationship of Alternatives to Statewide Planning Goals

Statewide Goal Number and Description	Consistency of Alternatives
1. Citizen Involvement - To develop a citizen involvement program that ensures the opportunity for citizens to be involved in all phases of the planning process. Federal and other agencies shall coordinate their planning efforts with the affected government bodies and make use of existing local citizen involvement programs established by cities and counties.	BLM's land use planning process provides for public input at various stages. Public input was specifically requested in developing issues, planning criteria, and the preferred alternative (PA). Public input will continue to be utilized in development of the final RMP. Coordination with affected government bodies, including the Governor's forest planning team, has also been ongoing and will continue. BLM has used county planning departments to provide linkage to local citizen involvement programs.
2. Land Use Planning - To establish a land use process and policy framework as a basis for all decisions related to use of land and to assure an adequate factual base for such decisions and actions.	The PA and other alternatives have been developed in accordance with the land use planning process authorized by the Federal Land Policy and Management Act of 1976 which provides a policy framework for all decisions and actions. The process includes issue identification, inventories and evaluation of alternative choices of action. Intergovernmental coordination in the planning process is discussed in chapter 5 of the RMP/EIS.
3. Agricultural Lands - To preserve and maintain existing commercial agricultural lands for farm use, consistent with existing and future needs for agricultural products, forest and open space.	None of the alternatives exclude appropriate BLM-administered land from grazing use or affect the use of other lands for agriculture use. Special areas and recreation sites would be closed to grazing or agricultural use.
4. Forest Lands - To conserve forest lands for forest uses. Growing and harvesting of forest tree species is the leading use on forest land consistent with the sound management of soil, air, water, and fish and wildlife resources and provision for recreational opportunities and agriculture.	BLM-administered lands in the planning area are predominately forest land and woodlands. None of the alternatives would lead to substantial conversion of those lands to nonforest uses. Conversion areas such as new forest roads and utility rights-of-way would be limited to the minimum width necessary for management and safety, and the latter limited to existing corridors where practical. All alternatives are consistent with the state's forest land protection policies.

Appendix 4-R - Relationship of Alternatives to Statewide Planning Goals (Cont'd.)

Statewide Goal Number and Description	Consistency of Alternatives
5. Open Spaces, Scenic and Historic Areas, and Natural Resources - To conserve open space and protect natural and scenic resources. Programs shall be provided that will (1) insure open space, (2) protect scenic and historic areas and natural resources for future generations, and (3) promote healthy and visually attractive environments in harmony with the natural landscape character. The location, quality and quantity of the following resources shall be inventoried. a. Land needed or desirable for open space; b. Mineral and aggregate resources; c. Energy sources; d. Fish and wildlife areas and habitats; e. Ecologically and scientifically significant natural areas, including desert areas; f. Outstanding scenic views and sites; g. Water areas, wetlands, watersheds and groundwater resources; h. Wilderness areas; i. Historic areas, sites, structures and objects; j. Cultural areas; k. Potential and approved Oregon recreation trails; l. Potential and approved Federal wild and scenic waterways and state scenic waterways. Where no conflicting uses for such resources have been identified, such resources shall be managed so as to preserve their original character. Where conflicting uses have been identified, the economic and energy consequences of the conflicting uses shall be determined and programs developed to achieve the goal.	Natural, historic and visual resources were considered in the development of the alternatives. Availability of mineral, aggregate and energy sources would be greatest under the alternatives NA, A, and B. Timber management under the alternatives would impact natural and visual resources. Adverse impacts to visual resources, wildlife habitat, potential wild and scenic rivers and state waterways, and unique natural areas are greatest under alternatives NA, A and B, and least under alternative E. Water areas, wetlands and watersheds would be protected under all alternatives. See chapter 4 for discussions. Also see appendix 4-P for discussion of consistency with relevant sections of the Forest Practices Act and Rules. The PA attempts to balance conflicting uses in light of their consequences. Under alternatives NA, A and B, conflicting resource uses are generally resolved by allowing the (non-goal 5) uses fully with minimal limitations in order to meet economic and certain social needs, except where clearly prohibited by federal or state law, in which case the non-goal 5 use is limited only to the extent necessary. Under alternatives D and E, conflicting resource uses are almost always resolved by protecting the (goal 5) resource site or severely limiting conflicting uses to meet environmental and other social goals. Partial protection of (goal 5) resources is most obvious in alternative C and the PA. Even without any tradeoffs to enhance or maintain the existing commercial forest program, tradeoffs are necessary between goal 5 resource values. For example, mineral and aggregate resource or energy source access and development frequently conflict with all other goal 5 values, and strict guidelines for the management of designated or potential wilderness or federal wild rivers may virtually preclude development or active management to benefit other goal 5 resource values.

Appendix 4-R - Relationship of Alternatives to Statewide Planning Goals (Cont'd.)

Statewide Goal Number and Description	Consistency of Alternatives
6. Air, Water and Land Resources Quality - To maintain and improve the quality of the air, water and land resources of the state.	Federal and state water quality criteria would be met and water quality would be maintained and/or improved under all alternatives. See chapter 4, Effects on Water Resources, for discussion. Burning of logging slash under all alternatives would comply with the statewide Smoke Management Plan and the State Implementation Plan (see chapter 4, Effects on Air Quality, for discussion). Also see appendix 4-P for discussion of consistency with relevant sections of the Forest Practices Act and rules.
7. Areas Subject to Natural Disasters and Hazards - To protect life and property from natural disasters and hazards.	Natural hazard areas, particularly floodplains and areas with highly erosive soils, have been identified. All alternatives provide for appropriate management of natural hazard areas. Bureau-authorized development within natural hazard areas would be minimal under all alternatives, with project construction engineering reflecting site-specific conditions and requirements.
8. Recreational Needs - To satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts. Federal agency recreation plans shall be coordinated with local and regional recreational needs and plans.	The BLM actively coordinates its outdoor recreation and land use planning efforts with those of other agencies to establish integrated management objectives on a regional basis. Under all alternatives, opportunities would be provided to meet recreation demand (identified in Oregon's SCORP). Projected demand for activities on BLM-administered land would be met with the following exceptions: alternatives NA and A-C would not meet demand for nonmotorized travel; and alternatives A and B would not meet demand for camping, picnicking, studying nature, viewing wildlife, boating, swimming and other water play (see chapter 4, Effects on Recreation, for further discussion). There has been no specific interest in development of destination resort sites on BLM-administered lands.

Appendix 4-R - Relationship of Alternatives to Statewide Planning Goals (Cont'd.)

Statewide Goal Number and Description	Consistency of Alternatives
15. Willamette Greenway - To protect, conserve, enhance and maintain the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River as the Willamette Greenway.	All alternatives would protect BLM-administered land in the greenway.
16. Estuarine Resources - To recognize and protect the unique environmental, economic and social values of each estuary and associated wetlands; and to protect, maintain, where appropriate develop, and, where appropriate restore the long-term environmental, economic and social values, diversity and benefits of Oregon's estuaries.	No measurable impacts on estuarine resources from BLM-authorized activities are anticipated, under any alternative.
17. Coastal Shorelands - To conserve, protect, where appropriate, develop and where appropriate restore the resources and benefits of all coastal shorelands, recognizing their value for protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources and recreation aesthetics. The management of these shoreland areas shall be compatible with the characteristics of the adjacent coastal waters; and To reduce the hazard to human life and property, and the adverse effects upon water quality and fish and wildlife habitat, resulting from the use and enjoyment of Oregon's coastal shorelands.	All alternatives would preserve and protect BLM-administered and other coastal shorelands delineated in acknowledged coastal city and county comprehensive plans and land use regulations. All but alternatives C, D, and E would limit vehicle use of shorelands to protect wildlife habitat and other values.
18. Beaches and Dunes - To conserve, protect, and where appropriate develop, and where appropriate restore the resources and benefits of coastal beach and dune areas; and To reduce the hazards to human life and property from natural or man-induced actions associated with these areas.	BLM-administered land in the Pacific City Sand Dunes area is being used for a water treatment plant. If additional uses of the dunes area are proposed, a plan amendment would be required.

Statewide goals 10, Housing; 14, Urbanization; and 19, Ocean Resources are not applicable.

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Appendix 4-R - Relationship of Alternatives to Statewide Planning Goals (Cont'd.)

Statewide Goal Number and Description	Consistency of Alternatives
9. Economy of the State - To diversify and improve the economy of the state.	Alternatives A and B would contribute to economic stability by supporting BLM-resource-dependent employment and payments to counties at levels near or above those of recent years. Alternatives C, D, E and the PA would support lower levels of such employment due to diminished timber production. Employment in rural areas would be most affected. Alternatives C and D would support lower levels of payments to counties (see chapter 4, Effects on Socioeconomic Conditions, for further discussion).
11. Public Facilities and Services - To plan, and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.	Under all alternatives, BLM-administered lands may be made available for development of public facilities or services by other parties, if the action would be permitted under the local government comprehensive plan and land use regulations, and relevant state siting requirements. Under alternatives A and B, however, commercial timberland might not be made available for such uses.
12. Transportation - To provide and encourage a safe, convenient and economical transportation system.	All alternatives provide for accommodation of identified transportation needs, particularly for transportation of timber, but siting a major new transportation route (e.g., state highway) would require a plan amendment. Major utility corridors were considered and would be designated under all alternatives. The alternatives support state policy objectives to restrict use of BLM roads for access to non-resource development that would be inconsistent with state planning goals.
13. Energy Conservation - To conserve energy.	Conservation and efficient use of energy sources are objectives in all BLM activities. Although all but alternatives NA and A propose inclusion of some additional rivers in the National Wild and Scenic River System, which would restrict the possibility of development of their hydroelectric potential, there are no pending development proposals and those rivers are considered to have low potential for such use. Firewood sales would be permitted under all alternatives, but under alternatives C, D, E and PA, firewood availability would be limited by retention of wood on site to provide wildlife habitat and help maintain soil productivity, and by allocation of substantial acreage to limited or no timber harvest.Statewide Goal Number and Description